COAL AGE

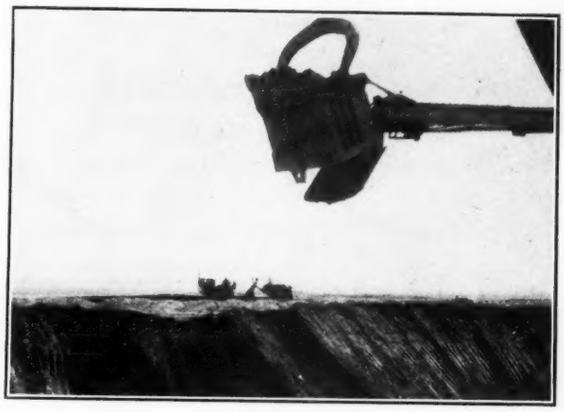
With which is consolidated "The Colliery Engineer" and "Mines and Minerals"
Published by McGraw-Hill Publishing Company, Inc.
WILLARD CHEVALIER, Vice-President

JULY 1937

SYDNEY A. HALE, Editor

R. DAWSON HALL — IVAN A. GIVEN — J. H. EDWARDS
LOUIS C. McCARTHY — WALTER M. DAKE — PAUL WOOTON

A. W. FISHER, Manager



Speed up stripping
With auxiliary equipment
See p. 310

CONTENTS

Volume 42 — No. 7

How Old Ben No. 11 Mine Was Reopened and Mechanized . . . 305
By IVAN A. GIVEN

Stripping Speeded by Large Tractor-Powered Scrapers 310

Twin Pump Stations Give Full Operating Flexibility 313

Coordination in Mechanical Mining — What to Expect 317
By EDWIN H. JOHNSON

Four-Yard Walking Dragline Strips 30-Ft. Overburden 319

Van Lear Adds to Plant to Serve Stoker-Coal Markets 321
By J. H. EDWARDS

Time-Studies Featured at Indiana Institute Session 331

Safety, Welding and Cleaning High-spot Illinois Trip 333

Mechanization and Safety Star at Denver Convention 337

Coal-Utilization Advances Scanned at Urbana Meeting 342

Editorials 303

Notes From Across the Sea 324

On the Engineer's Bookshelf 325

Operating Ideas 326

Word From the Field 330

New Equipment 345

● **Trial by error** was widely practiced in the early history of mechanization, but trial by progressive steps, with cost-reduction proofs as the jury, is now the order of the day. Carl McFarlin, president, Whitwell Smokeless Fuel Co., which started mechanization in 1934 to overcome adverse natural conditions in thin-seam coal, tells such a step-by-step story of progress in the August issue.

● **Stoker-coal** tonnage is growing; the business, however, is gravitating to those producers who appreciate the exacting demands of this market. Full recognition of this important key to success is given by Consolidation Coal, which has added special equipment to its Van Lear plant to serve the stoker-coal trade. Details of these additions and their operations are told in the article on page 321.

● **Mid-Western** expansion of stripping continues at accelerated pace. Last month a Coal Age editor visited one of the newest Illinois operations to gather material for stories on the excavating and cleaning methods employed. Early publication is scheduled. And a story of an Indiana plant using small stripping units—crowded out of this issue—is on the August docket.

● **Pumping** is a growing specter in the anthracite region. A 3,000-hp. pumproom of the Hudson Coal Co. handles water whether entering the pump under pressure or suction. Priming valves arranged to eliminate "false priming"— which starts the pumps and then fails—and regulated sequences to expose all the units to equal wear are among the notable features described in the article on page 313.

● **Safety, naturally,** dominates the thinking of the Mine Inspectors' Institute of America, which is assembling at Columbus, Ohio, for its 28th annual convention as this issue of Coal Age ambles to press. Ventilation, roof falls in mechanical mining, more frequent mine inspections and State legislation will be among the topics covered in the report to be published next month.

● **Time studies**—so necessary in securing the greatest efficiency in mechanized operations—take a double bow in this issue. Ed Johnson gives "a nearly ideal" division of time between actual loading and other work in an article beginning on page 317. The same subject also is discussed by P. R. Paulick in the report of the Indiana Mining Institute meeting on page 331.

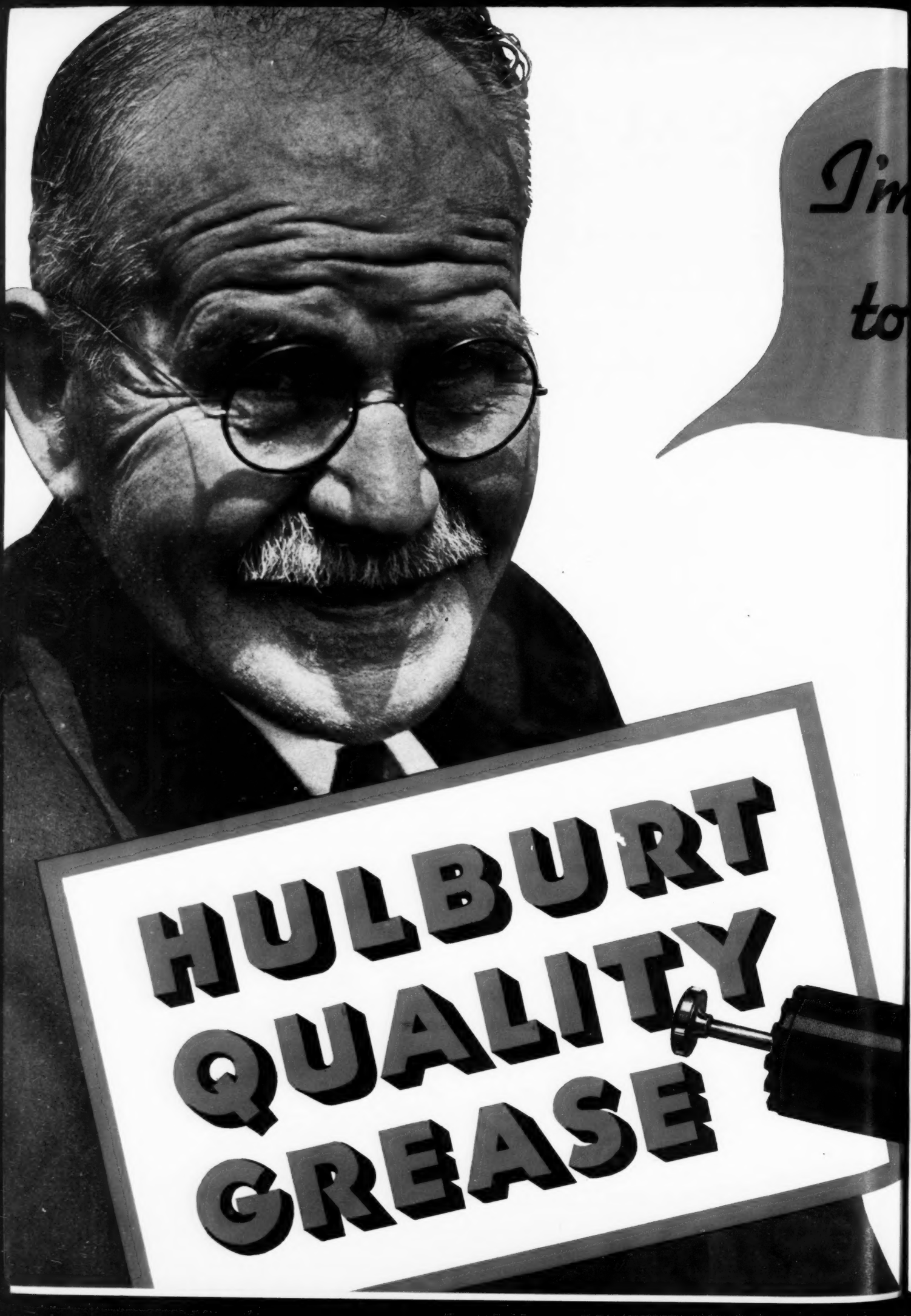
COAL AGE is published monthly on the 1st. $3 per year in the United States, Canada, Mexico, Central and South America; other countries, $5 or 20 shillings. Single copies, 35 cents each. Entered as second-class matter Oct. 14, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in the U.S.A. Cable address: "McGrawhill, N. Y." Member A.B.P. Member A.B.C.

Contents Copyright 1937 by

McGRAW-HILL PUBLISHING COMPANY, INC.
Publication Office, 99-129 North Broadway, Albany, N. Y.
Editorial and Executive Offices, 330 West 42d St., New York, N. Y.

JAMES H. McGRAW, JR., President — HOWARD EHRLICH, Executive Vice-President — JAMES H. McGRAW, Honorary Chairman
WILLARD CHEVALIER, Vice-President — B. R. PUTNAM, Treasurer — D. C. McGRAW, Secretary

Branch Offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.


I'm
to
HULBURT
QUALITY
GREASE

COAL AGE

Established 1911—McGraw-Hill Publishing Company, Inc.

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

July, 1937

Stimulant or Sedative?

ALTHOUGH unkind critics speak with scorn of our disrespect for the statutes, United States citizens actually exhibit a persistent and almost childlike trust in the efficacy of laws to cure deep-rooted economic and social ills. Let Congress enact appropriate legislation and the evils which beset us will automatically disappear, runs the national creed. Unfortunately for such blind faith, however, it does not always work out that way. Legislative remedies quite frequently create new problems and, unless these are conquered, the prescription may be worse than the disease.

The new Guffey-Vinson act is a case in point. As a curb upon unfair and ruinous practices within the industry, the law holds excellent promise. But should groggy battlers in the competitive pit assume that price control is the solution of all their troubles, they will lull themselves into a false security that can end only in disaster. Uncle Sam can guarantee price maintenance; he cannot guarantee volume maintenance. The railroads, which also sought government protection from internal price cutting, found that out.

Human nature is not changed by a splash of printer's ink. Bituminous producers must still reckon with the competition from other sources of energy. The only way coal can hope to hold its own is to produce it at costs which will enable the industry to maintain profitable prices at competitive levels. Regulation, therefore, increases, not lightens, the job of operating management. More than ever before this management must employ all the resources of improved technique and equipment to drive down costs without touching base wage standards. If this is not done, the new regulation easily can become the greatest handicap ever inflicted on the industry.

What is true with respect to the bituminous mines as a whole is equally true with respect to individual operations. Price fixing based upon weighted average district costs quite properly penalizes the inefficient mines in that area. So the high-cost operation must either reduce its production costs or see its tonnage dwindle. There is no other alternative. Producers who think otherwise are on the way to the scrap heap with the obsolete methods and equipment they cherished too long.

Not Easy

THREE REPORTS made by members of the Pennsylvania Anthracite Commission investigating the bootleg mining situation give concrete evidence that a solution of the problems which have been piling up on the hard-coal region in late years is not simple. All five commissioners, as Governor Earle points out (*Coal Age*, Vol. 42, p. 292), agreed that prices and freight rates should come down, but there was no unanimity of opinion when it came to dealing with unemployment. Three commissioners proposed State operation of abandoned collieries with a tonnage tax on present operators to finance the purchase of these idle mines; the tax was opposed by one commissioner who favored the State operation idea, while a dissident pair could see no value in public ownership but recommended regulation and a program to find employment for bootleg miners in other fields of labor.

Just how government ownership and operation could widen the markets for anthracite and still pay the same wages now prescribed in union contracts is not at all clear from the re-

port. In the absence of convincing explanation, the best that the proposal could do would be to regularize the employment of some men who, in the language of the advocates of public ownership and operation, now "are trespassers and are stealing property." If mine prices are to be reduced, there must be further reductions in production costs. Many legitimate anthracite producers back away from further experiments with cost-reducing equipment because of the resistance of local unions to the economic introduction of such machinery. Would labor be any more amenable if the State were its employer or is the assumption implicit, though unstated, in the proposal that the suggested State corporation would drag the issue into the open and fight it out publicly?

Other People's Quarrels

UNTIL the past few weeks, coal producers could justly take a detached view of the split in the ranks of organized labor and the drive of the Lewis group to capture mass-production industries not in the union fold. Two recent developments, however, may upset that comfortable position. The first is the admission of the Progressive union into the American Federation of Labor; the second, the threat to involve commercial mines in the CIO battle with the steel companies that have been resisting demands for a signed agreement with the union forces. Both developments have dangerous potentialities—with labor itself the greatest ultimate sufferer.

Any attempt upon the part of either mining union to extend its control into operations now under contract with the rival group will only result in interference with production and reduced working time. Certainly it will not endear organized labor to the coal companies who thus become victims in a quarrel not of their own choosing. Any attempt upon the part of the CIO to shut down mines which might sell coal to beleaguered steel mills would be clearly violative of the existing wage agreements and a blot on a generally commendable record of contract observance.

The union has been widely accepted by the coal industry as the most effective piece of machinery yet designed to perform the necessary job of wage control. In the long run neither management nor men have anything to gain from its breakdown. It would be regrettable indeed if failure at this particular time to tighten up a few loose nuts and chattering bolts should wreck the machine and compel a costly rebuilding.

Neutralization

CALCINED magnesium limestone is not slakable and, therefore, is ill-suited for mortar, but makes a good fertilizer and an excellent neutralizer. Those who have treated mine water to be used in breakers with hydrated high-magnesium lime report better results than can be obtained from high-calcium hydrated lime. With pure water, calcium hydroxide is 1,410 times as soluble as magnesium hydroxide, for 0.141 gram of the former hydroxide will dissolve in 100 grams of water and only 0.0001 gram of the latter. Presence of impurity in the water, however, makes a great difference in solubilities.

Cleaning in Transit

COAL NEEDS cleaning, not alone because of the percentage of ash in it but because the ash has a way of segregating itself in cars, bins and yards, with the result that, at times, coal of a very high ash percentage may be delivered for combustion. Much the same kind of segregation encountered in a preparation plant also occurs in car loading and unloading, bin filling and emptying, and in yard storage and reclamation. The dirt thus segregated in transit and rehandling, however, is not removed but reaches the furnace untempered by good coal.

The consumer thus gets coal which burns well and dirt which will not burn at all instead of a mixture which will burn uniformly. If the coal is cleaned mechanically, however, there is, at least, less dirt to segregate and none of the combined product so poor that it will not burn. The cry for clean coal would not have been so clamorous had the coal supplied always been well mixed and had it remained in that condition. Classification is a primary law of nature.

WORKING AREA CUT

+ By Mechanizing Old Ben No. 11 Mine After Recovery of Shaft Bottom

By IVAN A. GIVEN
Associate Editor, Coal Age

REOPENING of the air and hoisting shafts after they had been plugged with clay to kill a shaft-bottom fire accompanied by gas explosions, and conversion of the operation to a full mechanical-loading basis were 1936 developments at the No. 11 mine of the Old Ben Coal Corporation, Christopher, Ill. No. 11 mine last operated in January, 1931, when it closed because of market conditions, and at that time, according to reports to the Illinois Department of Mines and Minerals, was producing an average of 4,500 tons per day of eight hours with 617 men underground and 66 on the surface. The initial explosion, which began the sequence of events leading to the plugging of the shafts, took place on June 25, 1932. First coal was hoisted after the reopening on Sept. 24, 1936, and at the time this article was prepared production had been built up to an average of 3,100 tons in seven hours, using five track-mounted loading machines.

No. 11 mine was reopened to replace the tonnage lost by the flooding of Old Ben No. 18 mine, Johnston City, Ill. When the question of providing new producing facilities was considered, the choice lay between No. 11 mine and Old Ben No. 12, to the east. No. 11 finally was chosen, in spite of anticipated difficulties in recovering the shaft bottom, because it was equipped with modern preparation facilities, bigger cars and better hoisting equipment and also because natural conditions were substantially better. The east entry in No. 11, for example, was driven with very little timber, whereas the corresponding west entry in No. 12 was closely timbered throughout. In fact, the No. 11 main was advancing into No. 12 territory at the time No. 11 was closed, and present workings are in the territory opened up by this main.

Average thickness of the Illinois No. 6 seam at No. 11 is 132 in. From 4 to 6 in. is left down on the floor and from 6 to 12 in. is left up in the top to hold the roof. Cars are hoisted through a 607-ft. deep shaft 19x12 ft. inside the timbers. Steel I-beam buntons were used when the shaft was first built. In addition to two hoisting compartments, the shaft includes two 8½-in. pipe compartments, or "quarter shafts," one at each end, for fire protection lines (see below). The original timber was yellow pine, and as a protection against fire the shaft was lined with gunite held on expanded-metal mesh.

Total hoisting distance is 667 ft., and a 7 ft. 4 in. cylindrical hoist drum is installed and is driven by the first electric hoist motor with flywheel to be placed in service at a coal mine in the United States. Caging data are: cage weight, 15,300 lb.; car weight, 3,800 lb.; car capacity, mechanically loaded, 3.75 tons; rope diameter, 1⅛ in.; maximum rope speed, 2,600 f.p.m.; normal hoisting rate, 125 cars per hour, to be increased to 130 by increasing the grade of the tracks to and from the cages, supplemented by forced ventilation of the hoist motor.

Dimensions of the auxiliary air, man, material and escapement shaft, 500 ft. north of the hoisting shaft, are 11 ft. 2 in. x 23 ft. 2 in. It includes three compartments, viz.: air, 10 ft. 10 in. x 11 ft. 3 in., net; cage compartment, men and materials, 10 ft. 10 in. x 7 ft. 10 in.; escapement compartment, fitted with steel stairway, 10 ft. 10 in. x 2 ft. 9 in. Originally, the air and escapement shaft was timbered throughout, but in repairing the damage due to the explosions and fire, the bottom part, which had funneled out as a result of caving, was concreted. Like the hoisting shaft, the timbered part of the air and escapement shaft was protected by gunite and expanded-metal mesh.

At the time the mine was closed in January, 1931, it was believed that the shutdown would be for only a few months. In accordance with usual practice, the shaft bottom was separated from the rest of the mine by temporary seals of shiplap. These seals (*T1* to *T4*, inclusive) were placed approximately in the positions shown in Fig. 1. Concrete stoppings between the air intake heading and the rest of the bottom permitted the east side to be closed off with only two seals.

The method of sealing detailed just above was adopted for two major reasons: (a) prevention of falls and spalling of ribs from the temperature and moisture changes involved in continuous ventilation of the entire mine, and (b) elimination of continuous fan operation while at the same time providing access to the shaft bottom, where all mine equipment except cars was stored, for pumping, inspection and other attention. The mine is dry, most of the water originating in the shafts. Pumping three hours a week up to the time of the explosion was the normal schedule. Thirty minutes before each pumping period, the fan was started and was operated during pumping and for 30 minutes afterward, although normally natural ventilation between the shafts was sufficient to keep the bottom clear. No power was on the bottom at any other time than the pumping period. The last pumping before

the explosion on June 25, 1932, was on June 21.

When the mine was closed, the shafts were fenced off with barbed wire about 5 ft. away from each opening. Twenty-four-hour watchman service was inaugurated and the general public was excluded from the grounds, although people living in some near-by houses commonly used a path through the mine yard. The initial explosion on June 25, 1932, took place in the air shaft at 5:20 p.m. The barometer was 29.30 and falling and there was an electric storm to the east. The cause of the explosion has never been determined, but the ignition of the gas is believed to have resulted from some act of a passerby.

Following the explosion, the gas burned about 15 ft. high over the air shaft, igniting the shaft timbers, which broke out and fell to the bottom. Here they continued to burn, the heated air rising up the shaft and establishing circulation across the bottom from the hoisting shaft. With this circulation pulling air into the mine and diluting the gas, now coming out of the mine into the bottom through the burst seals, to the point where it would ignite, the initial explosion was followed at more or less regular intervals by additional explosions. These were confined to the vicinity of the shaft bottom, where sufficient oxygen was available to make an explosion possible. In addition to the original fire in the air shaft, investigation during and after reopening gave rise to the conclusion that there were seven other fires at the points on the bottom indicated in Fig. 1.

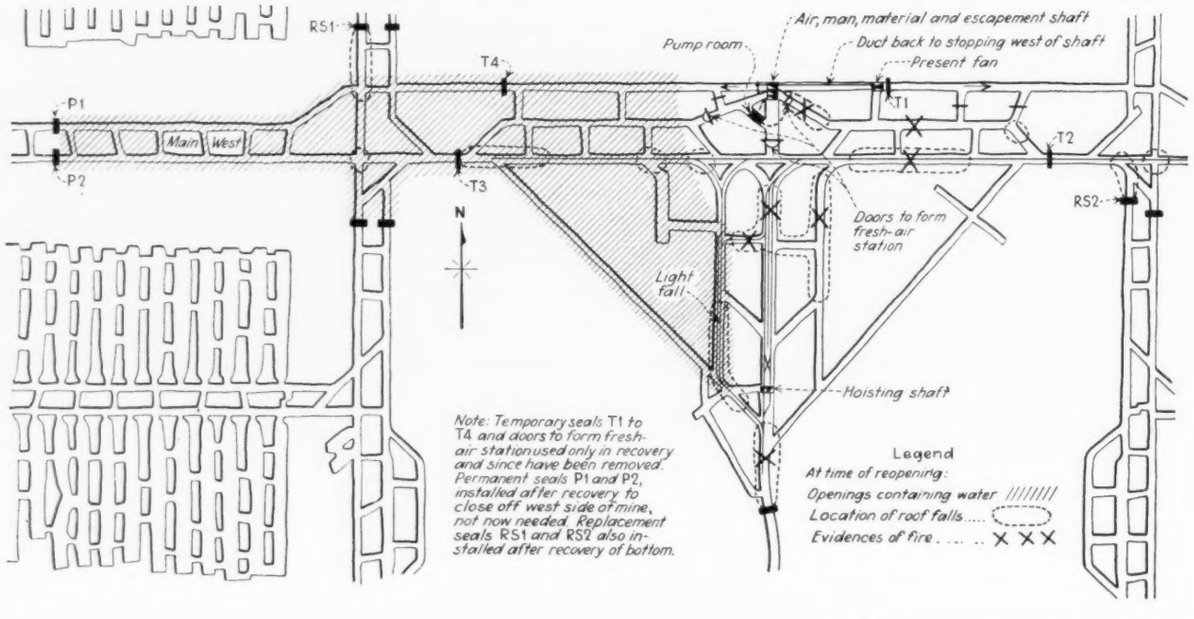
First attempts to cope with the air-shaft fire were based on placing a temporary wooden seal over the hoisting shaft as a preliminary to fighting the air-shaft fire with water. Continuance of the explosions made the sealing impracticable, whereupon flooding was considered, but discarded because it would have required too much time. Consequently, it was decided to plug the air shaft with dry clay and later add water to seal it at the bottom. This work was started June 27, 1932, using railroad cars to bring in the clay and a clamshell crane to dump it in the shaft, and was completed by noon June 28, by which time smoke stopped coming up the shaft. A total of eighteen railroad carloads of clay was used, filling the shaft up about 90 ft. above the bottom.

When the air shaft was plugged, however, smoke began coming out of the hoisting shaft and the explosions started again. So, on June 30, it was decided to plug the hoisting shaft in the same manner. Before smoke emission was stopped, 23½ carloads of clay had been dumped into the shaft, building up to about 50 ft. above the bottom, or just below the lower cage. Plugging was completed July 4, and on July 7, 1932, a supplementary seal of railroad rails, shiplap and 4 in. of concrete was placed across the top of the hoisting shaft about 12 in. below the ground level. This seal, equipped with pipe and valve for sampling, also was a safeguard against accidental ignition of any gas which might work up through the clay. In the case of the air shaft, however, caving had formed a crater about 40 ft. in diameter at the surface.

As a preliminary to reopening operations, work was started Feb. 25, 1936, on repairing the top of the air shaft, resetting the headframe and repairing the fan casing, damaged by the fire and explosions. Otherwise no appreciable damage was suffered by the ventilating unit, although the partition between the air and cage and escape compartments in the shaft was destroyed or rendered useless. About 16½ ft. of timbering was installed to get to the bottom of the crater at the top of the shaft. On May 1, 1936, the seal on the hoisting shaft was broken to provide an opening for the intake duct to an exhaust fan. A chimney discharge, also of wood, was placed vertically (see accompanying picture) to carry the gases above ground level. Output of the fan, when tested in the atmosphere, was 45,000 c.f.m. at a water gage of 4.7 in.

The fan was installed at the hoisting shaft with the idea that it might be possible to establish circulation down the air shaft and up the hoisting shaft through the clay plugs and thus keep the air shaft free of gas. Hopes were realized in practice, although the fan output at times dropped to as low as 1,800 c.f.m. and never, in the course of any test, exceeded 5,200 c.f.m., with a water gage of close to 4 in., compared with the shaft water gage of 2.5 in.

Fig. 1—Plan of shaft bottom at Old Ben No. 11 mine, showing location of seals, fresh-air station, fires and falls; also present entrance to runaround track


RS1
T4
Pump room
Air, man, material and escapement shaft
Duct back to stopping west of shaft
Present fan
P1
Main West
P2
T3
T1
T2
RS2
N
Doors to form fresh-air station
Light fall
Hoisting shaft
Note: Temporary seals T1 to T4 and doors to form fresh-air station used only in recovery and since have been removed. Permanent seals P1 and P2, installed after recovery to close off west side of mine, not now needed. Replacement seals RS1 and RS2 also installed after recovery of bottom.
Legend
At time of reopening:
Openings containing water
Location of roof falls
Evidences of fire

The major objective in the reopening program was the reerection of seals to close the shaft bottom off from the rest of the mine and permit reestablishment of ventilation. This meant, however, tackling the problem of close to 2½ square miles of workings filled with gas. Constitution of the mine atmosphere is indicated by the results of tests on two samples taken Sept. 15, 1933, which

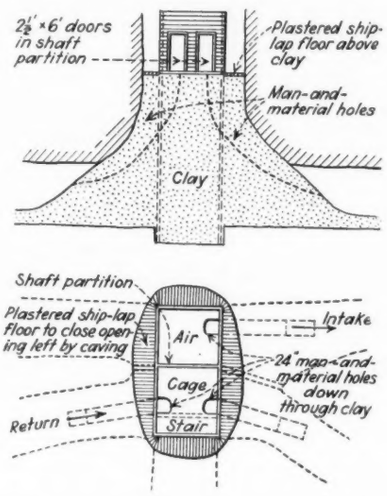


Fig. 2—First entrance to the mine was through small man-and-material holes driven down through the clay in the air shaft, as shown diagrammatically above. Air circulation was established through these holes by closing doors in the partition between air and hoist compartments

showed the following: carbon dioxide, 4.2 and 4.3 per cent; oxygen, 1.7 and 0.9 per cent; carbon monoxide, none; methane, 66.6 and 69.6 per cent; nitrogen, 27.5 and 25.2 per cent. But before the seals could be replaced, a number of preliminary problems had to be solved, including getting to the bottom of the air shaft and establishment of circulation to the site of the first seal, as it was decided, if possible, to carry fresh air along rather than adopt any other system.

Fresh air was chosen, first, because of the reduced hazard in case a permanent current could be established and, second, because apparatus would have been a severe handicap in the work in prospect, which included sinking, tunneling, transportation of material over falls, and similar tasks. As evidence of the care in planning and conducting the reopening operation, not a single lost-time injury was incurred in the actual recovery work. Full cooperation was received from the men, and their courage and willingness to forward the work is cited by the management as one of the biggest elements in the successful completion of the task.

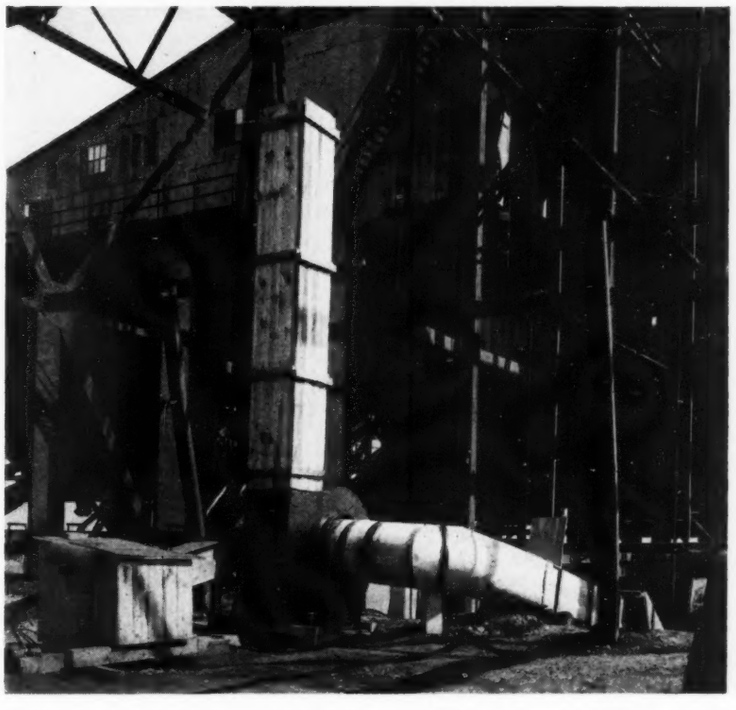
On May 3, 1936, recovery work started with breaking in in the southeast corner of the air shaft, using a sinking bucket for handling men and materials. Sinking was carried on with canaries, safety lamps and self-rescuers always present. Air during the initial stages was pulled down the air shaft and over to the hoisting shaft by the fan tapped into the hoisting-shaft seal. When the clay had been excavated down to within about 30 ft. of the bottom, preparations were made for establishing circulation from the main fan to the point where it was proposed to erect the first seal.

As a preliminary, a floor of shiplap plastered with wood fiber was built slightly above the clay to seal the interval between the shaft compartments and the new wall of the shaft, several feet from the shaft timbers. This interval was a result of a funneling out of the shaft up about 75 ft. as a result of caving. The floor was designed to prevent air from the main fan, which was to be used in establishing circulation to the site of the first seal, from escaping in the course of later operations into the space around the compartments and short-circuiting to the return. The partition between the air and cage compartments then was carried down to the clay and fitted with two doors, so that by closing the doors the air from the main fan, instead of going directly to the cage compartment and then to the surface, could be forced to travel down a proposed man-and-material hole, around past the site of the seal and back to other holes.

Location of the man-and-material holes is shown in Fig. 2. These were started inside the shaft compartments and were driven down along the shaft walls until they broke out of the clay at the bottom. Only one hole was put down from the air compartment, as it was expected that the intake airway east of the shaft would be clear of falls, which it proved to be. Two holes, one to each side, were put down on the cage side with the idea that if one approach to this side was blocked, the other might be open. In this case, the approach from the east side was found to be closed. As soon as the holes were broken through, two partition doors noted above were closed, establishing circulation from the main fan—175,000 c.f.m. capacity—through the air-compartment hole, out to the first crosscut south from the east intake and back to the west cage compartment hole.

The man-and-material holes were completed on June 2, 1936, and tem-

By tapping this exhauster, with chimney, into the seal over the hoisting shaft, mine officials were successful in establishing a slight circulation between air and hoisting shafts through the clay plugs. This circulation was sufficient to establish down pressure for the sinkers in the air shaft and thus prevent gas from leaking through the clay



porary Seal T1 was immediately started and completed the same day. In the construction of this and Seals T2, T3 and T4, shiplap and wood fiber plaster were employed. When the shiplap had been nailed up, strips were tacked on between joints and plaster was applied between the strips as in Fig. 3. T1 seal, with an area of about 140 sq.ft., was built in 1½ hours. Then, also on June 2, T2 seal, 180 sq.ft., was erected in 2¼ hours. Curtains were used to direct the air around to the site of No. 2 and considerable assistance was derived from a change in barometric pressure, which drove the gas back inby of the seal site.

Seals Built From Roof Down

Installation of the T1 and T2 seals left only the west side of the mine to be considered, as it was believed that the permanent seal (3 ft. of concrete) south of the hoisting shaft probably was still serviceable, which proved to be the case. On the west side of the bottom, officials were hoping that sufficient water had collected in a swag to form a water seal. In this, however, they were disappointed and so, on June 3, were forced to build Seals T3 and T4 down from the roof to 6 in. below the surface of the water—at that point up to within about 18 in. of the top. While a projection of 6 in. down into the water was not as much as would have been liked, due to the possibility of a heavy change in barometric pressure more than overbalancing 6 in. of water and consequently permitting an outflow of gas, it was the best that could be done under the circumstances and served the purpose.

After the T4 seal was completed, the remainder of the clay was cleaned out of the bottom of the air shaft to permit hoisting of material. Then a fresh-air station for emergency use was constructed by erecting three doors, which, with a stopping already in place, would permit closing off the openings near the air shaft (see Fig. 1) to form an air chamber.

This fresh-air station was a safety measure in the event of a long-continued fan stoppage, which in turn would mean cessation of power service due to a storm which also would lower the barometric pressure and bring out gas, possibly through the seal south of the hoisting shaft, the condition of which could not at that time be determined. Power failure also meant, pending rebuilding of the stairway in the air shaft, that no one could leave the mine in the usual manner via the sinking bucket. The men were instructed to go to the fresh-air station as soon as the ventilating current stopped, close the doors and prepare to plaster them. The volume of the station was sufficient to provide air until the power returned, if in a reasonable time, or until an emergency hoist could be rigged up.

Upon completion of the fresh-air station, work was directed toward cleaning out around the air-shaft bottom, getting the pump in operation

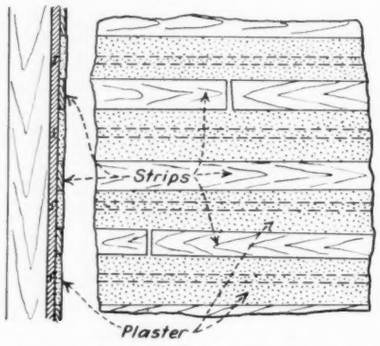


Fig. 3—Method of constructing temporary seals

and laying lines to pump down the water accumulations west of the bottom and elsewhere, concreting the bottom of the air shaft and installing guides and cage for hoisting dirt cars, cleaning out air-shaft sump, etc. The bottom in the vicinity of the air shaft was covered with a sheet of clay about 24 in. thick as a result of water action. As soon as pumping facilities were available, the water height was reduced and the seals were built down correspondingly. Eventually, the water was pumped down to about 5 ft. below the roof, permitting access to the seal south of the hoisting shaft.

Fourteen days after the mine was entered through the air and escapement shaft, on June 16, the hoisting shaft was unsealed, and on June 21 the cages were taken out. The next day the work of removing the clay was started, using a sinking bucket, and on June 30, 1936, the bottom of the main shaft was reached. Maximum thickness of the clay sheet at the hoisting shaft was about 6½ ft., tapering down to about 18 in. on the upper end of the loaded track to the north. When a space of about 15 ft. had been cleared out on the loaded side of the shaft to accommodate cars, the recovery seals (*T1* to *T4*, Fig. 1) were knocked out and the work of clearing the mine of gas was started, continuing for two days from July 21. Previously, the normal direction of air circulation had been reestablished: i.e., down the air compartment of the air, material and escapement shaft and up the hoisting shaft. Finally, on July 31 and Aug. 1, 1936, permanent concrete seals (*P1* and *P2*, Fig. 1) were built to close off the west side of the mine and in addition two old seals which had been damaged were replaced by new seals *RS1* and *RS2*. The seal to the south of the hoisting shaft later was supplemented by a new structure, completed shortly before May 1 this year.

Between the middle of August and the middle of October, 1936, 3,600 cars of rock and refuse were loaded out of the shaft bottom. In one case, on the loaded track north of the hoisting shaft, the I-beams had been heated by a fire and had sagged and fallen, permitting the roof to cave to a maximum height of 43 ft. over the rail, letting down about 4,400 tons or rock. Caves in the east runaround, or empty track, were yet to be cleaned up at the time this article was prepared, as, with only the east side of the mine operating under the present set-up, the west runaround furnishes all the empty storage necessary. To utilize this west runaround, a short curve was cut in from the main heading.

Recovered Locomotives

All the locomotives stored on the shaft bottom, which were partly or completely buried in clay, were salvaged and worked over without the loss of a single armature. The breast machines in use at the time the mine was closed were junked to make way for the track-mounted type now employed with the loading machines. To protect the shaft bottom, a complete fire-fighting system was being installed at the time this article was prepared. This system is connected to the power-plant cooling pond on the surface through pipes in the 8½-in. quarter-shafts noted above. Laterals are laid in all shaft-bottom openings, with sufficient outlets to permit reaching any part of the bottom with a hose line. The lateral system also is connected to the shaft-bottom pump gathering from three locations. This arrangement makes it possible to discharge the water into the fire-protection system and from there use it for sprinkling roadways adjacent to the shaft at night. Also, this arrangement obviates pumping the water to the surface and bringing it down into the mine again.

Away from the shaft bottom, no conditions different from those that normally could be expected after a 5½-year shutdown were encountered. Since the reopening, the main-line tracks to the east side of the mine have been retied completely with

creosoted ties. To take care of the power requirements of the mechanical loaders and supplementary equipment, a 300-kw. m.g. set was installed at a borehole 1¼ miles northeast of the shaft. This borehole furnishes most of the power for the east side of the mine and was another reason for selection of the east workings when operations were resumed. Feeder capacity also was increased, and at present one and sometimes two 1,000,000-circ.mil lines are installed. Also, 1,000,000-circ.mil return lines —in some cases 1,500,000—have been installed to supplement the track return and insure an adequate power supply. All feeders and returns are suspended from the rib or roof.

Primarily as a means of reducing the pressure differential on the partition wall in the air, material and escapement shaft and consequently avoiding the possibility of losses inherent in carrying the maximum differential on the partition, the original reversible centrifugal fan with forward-curved blades, located at the top of the shaft, was replaced with a 6-ft. Jeffrey Aerodyne unit installed in the main air intake about 200 ft. east of the air shaft (Fig. 1). The old fan, a 6x12-ft. unit driven at 183 r.p.m. by two 150-hp. motors drawing 235 kw., furnished 118,050 c.f.m. at a water gage of 4.55 in. in ventilating the entire mine. This fan is being kept in operating condition for use in case of emergencies.

Saved $1,270 per Month

As noted above, the west side of the mine was shut down with the adoption of mechanical loading. The new fan, driven by a 75-hp. motor drawing 58.5 kw., therefore ventilates only the east side of the mine, with a branch duct to and through a stopping a few feet west of the air, material and escapement shaft discharging into the intake airway leading to the permanent seals west of the bottom. Fan speed (1,135 r.p.m.) was adjusted to give 100,000 c.f.m., which is ample for all parts of the mine left open. Water gage is 3.50 in., and the fan, at the same speed, will give about 80 per cent of the above air volume in reverse. Under the present arrangement, the pressure differential on the partition in the air, material and escapement shaft is approximately ¼ in. of water, as compared with about 3.6 in. when ventilating with the old fan at the top of the shaft. Power savings on the above basis are $1,270 per month. The duct to the stopping a few feet west of the bottom is an 18-in. spiral-riveted pipe, which transmits 7,500 c.f.m. to the seal location to supplement the natural ventilation at this point.

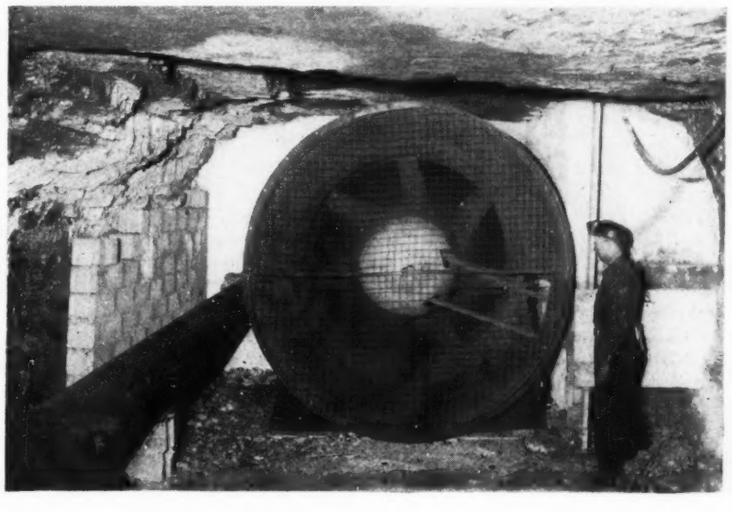
Production equipment in use at the time this article was prepared was as follows: five Goodman track-mounted loaders; four Goodman slabbing machines with 9-ft. cutter bars; six pit-car loaders; two Sullivan CE7 shortwall machines with 8-ft. cutter bars, one for the pit-car loaders and the other in entries in an isolated section; eleven Dooley Bros. electric coal drills; sixteen 6-ton General Electric gathering locomotives; two 8-ton Jeffrey gathering locomotives; one 13-ton and one 20-ton Westinghouse haulage locomotives; two 15-ton General Electric haulage locomotives; one 8-ton Westinghouse push motor, used in moving loads up to the cage on the shaft bottom; and 310 pit cars holding 7,200 to 7,600 lb. mechanically loaded. To operate this equipment, an average of 164 men on the day shift and 48 on the night shift, exclusive of surface men, are employed. Higher production per place per day through this mechanization program made it possible to shut down the west side of the mine.

Development at Old Ben No. 11 and other Old Ben mines is based on the use of the closed panel: i.e., a group of rooms surrounded by a solid pillar of coal except for the openings for the two headings constituting the room entry. At No. 11 mine, the lay of the coal now being developed naturally indicated the adoption of 20-room panels, with ten of the rooms on one side of the entry and ten on the other. One loading machine normally is assigned to each such panel, with such supplementary entry-driving for development as may be necessary. As a rule, the room entry for a panel is driven up and the rooms are necked in advance of regular operation with a loading unit. In working in a panel, the loading machine and other equipment usually alternate from one side of the entry to the other.

Panel headings are driven 14 ft. wide on 40-ft. centers. Room width usually is 24 to 25 ft., or as much as the loading machine can conveniently reach, and the standard center distance is 43 ft., leaving a room pillar 18 to 19 ft. thick. Standard room depth is 250 ft. Crosscuts between rooms are driven on an angle of approximately 40 deg. The first crosscut is driven 50 ft. from the entry, with succeeding crosscuts spaced 60 ft. or less apart. At the time each crosscut is started, with the exception of the last, a switch is laid to permit loading in both the crosscut and room face with a minimum of tramming on the part of the loading machine. Room tracks are connected through the first crosscuts, supplemented by additional connections when required as a result of falls or other reasons. Connecting the room tracks through the first crosscuts enables the serving locomotive to deliver an empty to the loading machine without backswitching and consequent loss of time.

Two gathering locomotives serve each loading machine. As a rule, each such locomotive handles a maximum of three or four empties at a time. As each car is loaded, it is detached from the trip and coupled to the main loaded trip on the heading or in an adjacent place until all three or four cars are loaded, whereupon the gathering locomotive gets

No. 11 mine now is ventilated by this underground fan, viewed here from the intake side. The 18-in. spiral-riveted pipe at the left carries air back through a stopping west of the air shaft, from which it is directed back to the permanent seals west of the bottom (Fig. 1)



another trip from the empty storage. By the time one of the two locomotives comes out of the place with a loaded car, the other has detached its load and is waiting just outby the switch to the crosscut track for the other to come out. Consequently, the waiting locomotive can push the car straight ahead to the loading machine without stopping to backswitch. While more tracklaying is required, this system at other mines of the company, according to time studies, reduces car-changing time, or rather the time required to replace a load under the loading-machine boom with an empty, to 27 to 35 seconds as a rule. This interval usually suffices to enable the loading machine to change position.

Other advantages of the system outlined just above are fewer derailments, elimination of the hazard and loss of time in holding up and tramming under cables in trolley-wire mines, elimination of the assembly of small trips in the vicinity of the loading machine with the attendant noise, and ability to pick up a room with a minimum loss of time in case of a fall. Relay locomotives move trips of twenty cars, as a rule, between panel storage points and the main partings. These relay locomotives also serve men cleaning up rib coal along haulageways and also any hand loaders, if employed, in the vicinity of the section. Rail weight in rooms is 30 lb. and steel ties are used on straight room tracks, with wood ties in switches.

Faces are undercut 8 to 9 ft. deep at No. 11 mine, and cuts are broken down with 3-in.-diameter low-pressure Cardox shells. Seven holes are drilled in a 24- to 25-ft. room. These holes are drilled in two rows, one row of three (two rib and one center holes) in the top and a second row of four down the face but above the characteristic No. 6 seam "blue band." Two of the four holes in the lower row are drilled along the ribs, while the other two are put in about 3 ft. on each side of the center line of the face and are shot first, followed by the rib holes in the lower row, the top center hole and the top rib holes.

Since the reopening, preparation has been improved by the installation of a chloride washer, to be followed by others; addition of a new refuse track with conveyors to improve the hand-picking of lump; installation of equipment for loading all sizes in box cars; and the adoption of facilities for spraying all sizes with oil prior to shipment to allay dust.

STRIPPING FACILITATED

+ By Large Tractor-Powered Scrapers At Mid-Western Operations

AS AN AID in opening box cuts in deeper overburden and for miscellaneous earth-moving jobs in connection with coal stripping, large self-loading and self-dumping scrapers pulled by tractors have been adopted by several strip-mining organizations, notably in the Middle West, in the past year. Miscellaneous tasks, made possible by the ability of the units employed to adapt themselves to various types of service, have included excavation of water-storage ponds, cleaning up slides in pits, building roads and railroad grades, digging drainage ditches, building dams, and other work. Rated capacity of the type most generally employed to date is 8 cu.yd., and the output, depending upon length of haul and other conditions encountered, varies from 50 to 110 cu.yd. per hour of actual operating time, exclusive of delays.

Possibly the earliest application of the type of equipment in question on an extensive scale was made by the Truax-Traer Coal Co. at its Forsyth strip mine, Elkville, Ill. Early in 1936, the equipment at this operation, which included a stripping shovel with 16-cu.yd. dipper, 95-ft. boom and 62-ft. dipper handle, preceded by a dragline with a 150-ft. boom and 10-cu.yd. light-type bucket, was supplemented by a LeTourneau "Carryall" scraper with a rated capacity of 8 cu.yd. powered by a Caterpillar 70 (gasoline) tractor. Later, a second unit was moved down from the St. David operation of the company. Advantages of the scraper as a means of moving the top soil back far enough in one operation to practically eliminate the possibility of slides due to weight on the edge of the cut, and also as a low-cost development unit permitting the dragline to continue at its normal task of coal production while the work in starting a new territory was carried on, were particularly apparent at Forsyth.

The first scraper application at Forsyth was opening the "south" box cut on the plan shown in Fig. 1. Overburden was reduced from 50-55 ft. to approximately 30 ft. In making the final cut to the coal, the shovel spoil was dumped on and across one slope of the Carryall pit. Between April 22 and June 4, 1936, on this job, 42,221 cu.yd. of overburden was moved an average of 300 to 400 ft. one way from the center of the cut to the center of the spoil pile. Hours totaled 805, and the output was 63.33 cu.yd. per operating hour and 52.44 cu.yd. per total hour.

The "north" box cut was the next task of the scraper equipment, assisted by a 2½-cu.yd. shovel and Euclid dirt wagons to speed the work. Total length of the box cut was about 1,500 ft., and the overburden was reduced from 40 to 55 ft.—mostly 50 to 55 ft.—to 30 ft. In the case of this box cut (Fig. 2) a ditch and ditch spoil bank along a barrier line made the usual method of spoiling back of the cut impracticable, so the Carryall and supplemental small-shovel product was wasted in a layer about 4 ft. deep in front of the cut for later rehandling with the regular overburden by the dragline. Maximum distance to which the scraper spoil was carried was approximately 1,200 ft. out from the box cut. Between June 17 and Sept. 20, 1936, a total of 83,510 cu.yd. of material was moved. Additional work in October brought the aggre-

gate output up to about 96,000 cu.yd. Records on the work from June 17 to Aug. 19 showed 60,312 cu.yd., 1,155½ hours total, and 1,056 operating hours (in part estimated).

Adoption of scraper equipment at Forsyth was followed almost immediately by the installation of a similar unit at the Fiatt (Ill.) operation of Truax-Traer to supplement equipment already in use, which included a stripping shovel with a 10-cu.yd. dipper, 90-ft. boom and 56-ft. dipper handle. Thicker overburden in a new location, making it difficult to use the shovel to good advantage in making the box cut for a new pit, was the major reason for installation of the unit. A second unit was installed almost immediately, and soon thereafter one was sent to the St. David (Ill.) operation of the company.

At Fiatt, the scrapers were first used in cutting down the overburden along the line of the box cut to a uniform depth of 25 ft. An average of 5 ft. of material down to the heavier clays was taken in this operation for a total length of about 3,500 ft. to a point where the overburden became lighter. The pit, as indicated in Fig. 3, was opened about 100 ft. wide by the scrapers, which moved the spoil back about 150 ft. Incidentally, elimination of weight on the edge of the cut was an important advantage at Fiatt also. The cut then was finished by the shovel, which deposited its spoil between the scraper spoil and the edge of the cut.

Another later Carryall project was the construction of a runway into the pit at one point. Length of this runway was about 450 ft., and the cut varied from nothing at the entrance to 20 ft. in the pit. Similarly, cuts about 225 ft. long were made in the pit also down to 20 ft. at the junction of the pit and the runway. Later, the scraper equipment was used in the construction of a storage pond and at the time this article was prepared three scrapers were employed in the construction of a railroad grade to a new pit. Length of the

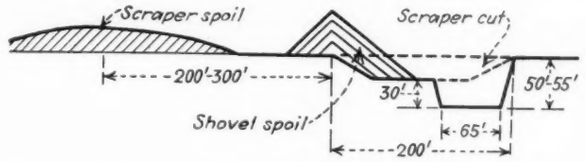


Fig. 1—Method of making south box cut at Forsyth mine, Truax-Traer Coal Co., using scraper equipment to reduce overburden thickness for shovel

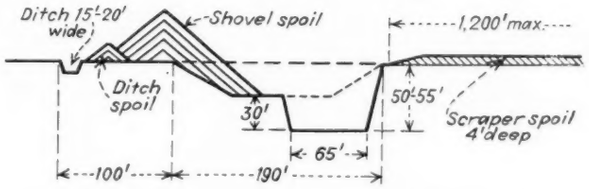


Fig. 2—Section of north box cut, Forsyth mine, showing ditch location and method of wasting scraper spoil in front of cut

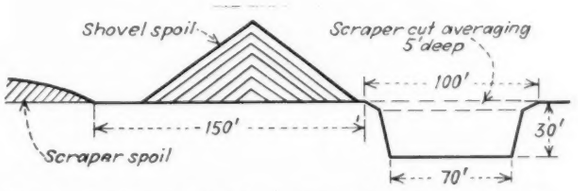


Fig. 3—Section showing how scraper was used in opening box cut at Fiatt Mine

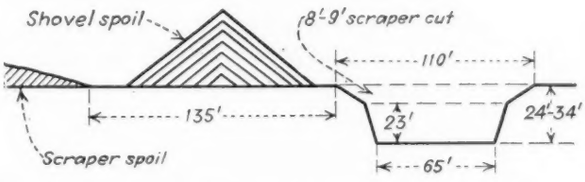
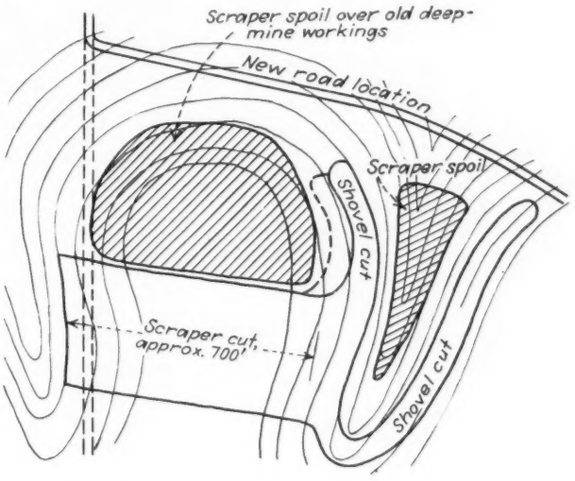


Fig. 4—Section showing use of scraper in making box cut, Percy mine, Southwestern Illinois Coal Corporation



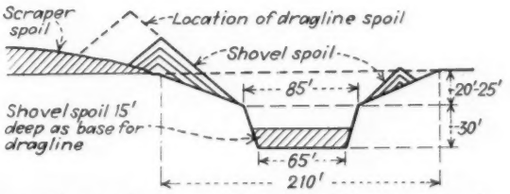
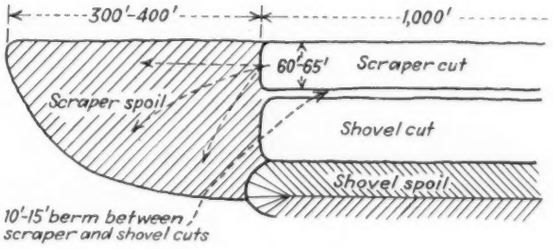


Fig. 5—Plan of box cut, spoil disposal and road relocation at St. David mine and section showing how box cut was made across the point of land shown in the plan



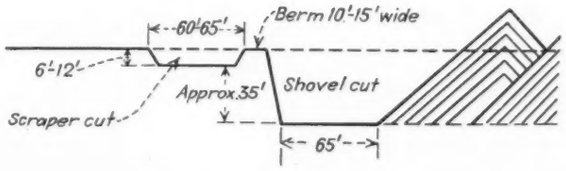
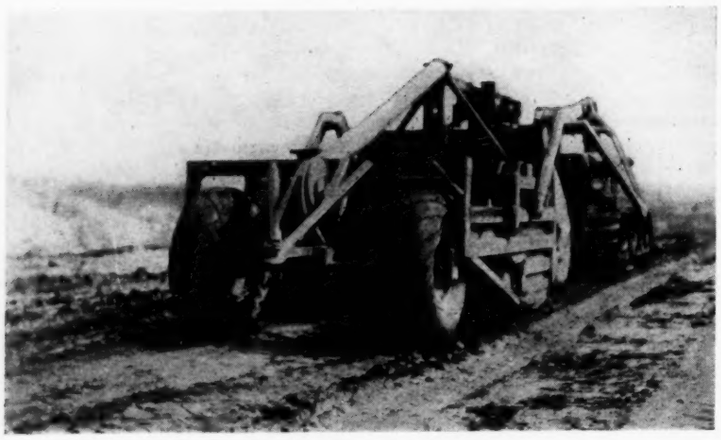


Fig. 6 (Right)—Plan and section of scraper work at Bobolink mine, Binkley Mining Co.



12-cu.yd. scraper unit in service at Bobolink mine, Binkley Mining Co.

grade is roughly two miles, width is 40 ft., maximum cut is 14 ft., and maximum fill is 26 ft.

The Fiatt scraper equipment moved an estimated total of 56,524 cu.yd. in April and May, 1936, in opening the box cut. Operating hours totaled 514; delays (including oiling, repairs, etc.), 54½, making the grand total 568½ hours. The round-trip haul from center of pit to center of dump was approximately 550 ft. In September and October, 1936, a total of 29,320 cu.yd. was moved by Carryall equipment in digging the incline and some miscellaneous excavation in 431½ operating hours. Between times, the equipment was employed in drainage work, cleaning up slides in the pit—in which it was found particularly advantageous—etc.

At the St. David operation of the Truax-Traer Coal Co., a Carryall unit was received from Fiatt in July, 1936, and was put to work in cutting down a hump along the line of a new box cut, using part of the spoil in the relocation of a road. The hump in question was formed through the thickening of the overburden on a point of land across the line of the box cut (Fig. 5). In the operation on the hump, the overburden was reduced from a maximum of 50-55 ft. to 30 ft. for a distance of about 700 ft. Equipment normally employed in stripping was similar to that at Forsyth: i.e., a 16-cu.yd. shovel and 10-cu.yd. dragline operated in tandem. Use of the scraper equipment made it unnecessary to take the dragline off production and go to the expense of moving it onto the location to make the preliminary cut and then move it back. Total length of the box cut, of which the hump was a part, was about 1,800 ft.

In reducing the depth of the overburden, part of the scraper spoil was deposited to the east over some old deep-mine workings (see Fig. 5), part was deposited in a ravine to the north of the hump cut and the remainder was used in constructing the new road. The latter task involved one-way hauls of as much as 1,000 ft. Width of the scraper cut was roughly 210 ft. at the surface. Width of the shovel cut was 85 ft. at the top and approximately 65 ft. at the bottom, and the shovel spoil was cast partly on the bank on both sides, with most of it going to the regular spoil side and part—about 15 ft. deep—in the pit behind. The shovel was followed by the dragline, operating on top of the shovel spoil in the pit and cleaning it up behind as it went through the hump, casting over the shovel spoil and onto the edge of the scraper spoil. As the dragline went through, it also took its normal cut off the bank in the direction of the advance. In cutting down the hump, the Carryall equipment, in the period May to August, 1936, inclusive, moved 100,246 cu.yd. of clay and other surface material in a total of 1,916½ operating hours. Delays of various types totaled 266 hours.

At a fourth Truax-Traer operation —the Burleigh mine, Traux-Traer Lignite Coal Co., Wilton, N. D.— one of the Illinois units was employed in opening a box cut on a plan substantially similar to that at Fiatt. Overburden thickness was reduced approximately 15 ft. Stripping at Burleigh is done by an electric shovel with 8-cu.yd. dipper, 90-ft. boom and 56-ft. dipper handle.

An 8-cu.yd. Carryall unit powered by a Caterpillar RD-7 (diesel) tractor, assisted part of the time by another similar unit, has been used at the Percy (Ill.) mine of the Southwestern Illinois Coal Corporation in making a box cut, ditching, road construction and miscellaneous work. In making the box cut, the overburden was reduced from 24-34 ft. to an average of 23 ft., in which operation a maximum of 8 to 9 ft. of clay was removed, leaving about 4 ft. in place. Spoiling was done as in Fig. 4 and operations were conducted to keep the round-trip haul within a total of 400 ft. as far as possible. Stripping at Percy is done by an electric shovel with 26-cu.yd. manganese-steel dipper. Total length of the box cut was about one mile, on about half of which the Carryall units were used. Output of the units was 45,440 cu.yd. Hours of operation totaled 740, including delays of 163 hours, largely resulting from the unit getting stuck in the mud. In

Scraper unit in operation at Forsyth mine, Truax-Traer Coal Co. Loading and dumping are controlled by wire cables from drums on the rear of the tractor

some cases it was necessary for the unit to first scrape up the thin muck and haul it out of the way in order to make a firm spot on which to travel and dump. Getting the weight of the spoil away from the bank was one of the advantages sought at Percy, in addition to a lower investment in development equipment.

The Bobolink strip mine of the Binkley Mining Co., Seeleyville, Ind., employs a 12-cu.yd. Carryall unit powered by a Caterpillar RD-8 tractor to help out its electric stripper with 105-ft. boom, 64-ft. dipper handle and 30-cu.yd. dipper in the east end of the workings. The scraper was adopted primarily to remove the soft surface and subsoil in front of the shovel cut. Length of the scraper cut is approximately 1,000 ft., and the scraper spoil is discharged on ground beyond the east end of the pit, as indicated diagramatically in Fig. 6. The scraper cut varies from 50 to 60 ft. in width and is started 10 to 15 ft. away from the edge of the shovel cut, leaving a protective berm. Working east along the 1,000-ft. length of the cut, the scraper takes about 6 to 12 ft. of material, reducing the depth of the overburden to be handled by the shovel to about 35 ft.

The scraper unit was acquired with the object of moving an average of 80 cu.yd. per operating hour. This minimum frequently has been exceeded in practice. On Feb. 25, for example, with inexperienced operators, an estimated total of 984 cu.yd. was moved over one-way distances varying from 450 to 800 ft. in eleven hours. Number of trips was 123. In starting a dump on soft ground, a LeTourneau "Angledozer" is installed on the front of the tractor. With the Angledozer pushing the soft stuff out of the way and the scraper dumping a thin layer of dirt behind and packing it to some extent, a firm roadway is built up and extended as the dump is built out. The Angledozer also has been found convenient in scattering occasional piles of shovel spoil placed on the bank in cleaning up slides or on other occasions where room on the regular spoil bank is not available. Leveling these piles makes it easy for the stripping shovel to pick them up with the regular overburden.

The Bobolink scraper unit also is employed in road building, dam construction and miscellaneous earth-moving tasks. The packing propensities of the unit have been particularly advantageous in building dams. Dams built by casting frequently have frozen on the top, so that when settlement of the lower part occurred an arch was formed, allowing the water to break through down the side instead of, as usual, over the top.

MARVINE PUMP STATION

+ Provides Complete Operating Flexibility Under Both Suction Head and Suction Lift

FULL-AUTOMATIC control and provisions for submerged operation feature the underground double pumping station of the Hudson Coal Co., located at the No. 2 Dunmore bed landing, No. 2 shaft, Marvine colliery, Scranton, Pa. The first section, planned and built between April 15 and July 8, 1933, to take care of conditions arising from the cessation of pumping at a neighboring operation, is equipped with two 5,200- to 6,700-g.p.m. centrifugal pumps driven by 1,000-hp. motors, and auxiliaries and control equipment for automatic or manual operation under either "suction head" or "suction lift." During 1936, a new pumproom on the opposite side of the shaft and practically an exact duplicate of the first was constructed. Here, however, a single 5,200- to 6,700-g.p.m. centrifugal pump of the same size and type as those on the other side has been installed, with provision for a second unit when its introduction becomes necessary. This also has a 1,000-hp. motor.

Choice of the site for the station represented a compromise between flooding a portion of the No. 3 Dunmore bed in the bottom of the basin at the southwestern end of the property, as well as parts of the underlying No. 3 and No. 4 Dunmore beds, and the increased head and decreased flexibility which would result from an attempt to keep these workings entirely dry. While installation at the low point was a possibility, a survey showed that it would be more feasible for the present to increase production from those portions of the three beds lying higher up on the southeastern slope of the basin and allow the lower workings to flood. Consequently, the station was located in the No. 2 Dunmore, thus decreasing materially the pumping head and assuring sufficient storage capacity to provide maximum flexibility of operation under various conditions of water inflow.

Incidental work in connection with the transfer of production included the driving of a rock tunnel southeast from the No. 2 shaft to cut the various beds and improvement of the shaft landing in the Clark bed (next above the No. 2 Dunmore) by the installation of a Wilmot car feeder and Nolan car stop and cager.

Installation of the pumping station in the No. 2 Dunmore also favored submerged operation, with its accompanying possibility of a still

further reduction in pumping head, because only two dams were required to isolate the station completely from the surrounding body of water. As the No. 2 shaft serves all three of the Dunmore beds, one dam was necessary to close it off. This dam was installed in the Dunmore No. 3 landing (Fig. 2), completely filling the space between the roof and the floor on all open sides of the shaft. It has a thickness of 8½ ft. across the shaft opening, rests on 16-in. I-beams and is constructed of concrete reinforced with ½- and ⅜-in. round steel rods and 25-lb. rail.

While the water normally rises into the No. 3 Dunmore, where the pump suction inlets are located (Fig. 2), through openings made in the course of mining operations, two additional inlets made of 24-in. terra cotta and wood pipe were left under the shaft dam as a precautionary measure. The second dam, also of reinforced concrete, was erected across the top of the No. 11 rock slope between the No. 2 and No. 3 Dunmore beds (see Fig. 1). This slope originally served as an airway between the two beds. In addition to the No. 11 slope dam, construction in the No. 2 Dunmore bed included the pumproom proper, suction wells and a new airway for ventilation.

Lining Rings Protect Room

The pumproom opens out to the hoisting compartment of the No. 2 shaft through an entranceway 29 ft. long, protected by steel I-beams, and was made by skipping the sides, top and bottom of the gangway to make a room with a maximum inside width and depth of 18 ft. and 15 ft. 9 in., respectively. The room is walled with Schafer lining rings 18 in. thick. The space between the lining and the rock or coal is packed with rock. A total of 60 rings were used, making the length of the room 79 ft. Complete rings were installed (Fig. 2) except where the pump foundations and the plug valve vaults made it necessary to break them at the bottom, in which case they were tied into the respective structures. The floor of the pumproom consists of a 6-in. concrete slab laid on a rock pack.

Pump suction lines are carried down to the No. 3 Dunmore gangway in vertical wells, which were sunk by hand. These wells, one for each pump, were made approximately 6 ft. square to allow wrenches to be used in tightening flange bolts on the suction lines, and were concreted in after installation was completed.

A 5,000-cu.ft.-per-minute Buffalo Forge fan has been installed in the pumproom to assist in its ventilation. A rock pack held in place by a masonry wall was built back of the pumproom to reduce the width of unsupported roof and thus decrease the possibility of falls which might carry over into the station.

pumped unless enough of it is present in the sump to raise the water in the wells to a height of 20 ft. below the pump centers.

At a speed of 745 r.p.m., the rated capacity of each of the Marvine units is 5,200 g.p.m. against a total dynamic head of 550 ft. and 6,700 g.p.m. against a total dynamic head of 485 ft. Efficiency over this range exceeds 80 per cent, and

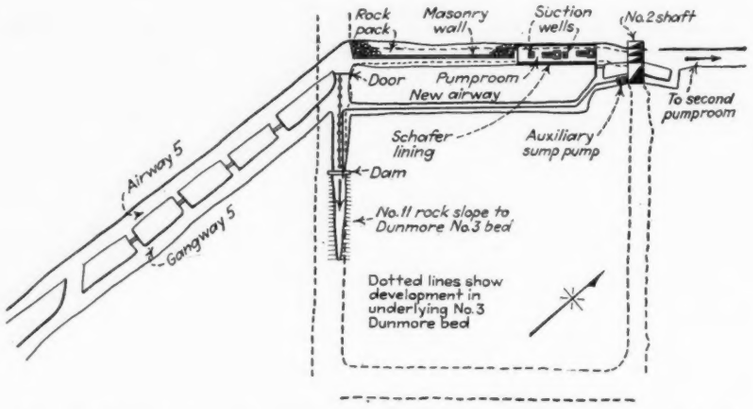


Fig. 1—Pumproom and auxiliary construction in Dunmore No. 2 bed, No. 2 shaft, Marvine colliery

The main pumping units consist of Barrett-Haentjens 14-in. 4-stage centrifugal pumps with all-bronze casings, Duraloy chrome-iron impellers and stainless-steel shafts, driven by 1,000-hp. 2,300-volt 25-cycle 4-pole 750-r.p.m. General Electric linestart motors. With the 25-cycle current available for the operation of pumps of such large capacity, choice of possible standard motor speeds was reduced to two: 1,500 and 750 r.p.m.

Why Pump Types Were Chosen

Considerations governing the selection of the 750-r.p.m. four-stage units therefore were as follows: possibility of rapid wear of the seal rings and consequent loss of efficiency with the high-speed type, due to the acid character of the water; the better operating characteristics of the slow-speed type under the high suction lift (20 ft.) prevailing at times; the ability of a four-stage pump to care for the wide variation from maximum suction lift to maximum suction head more efficiently; and the fact that the double-suction, 1,500-r.p.m. two-stage pump with series piping would require about as much floor space as the 750-r.p.m. four-stage pump. Fig. 2 shows suction wells about 42 ft. long from the roof of the Dunmore No. 3 bed to the pumproom, but no water is

reaches a maximum of 84½ per cent at 6,400 g.p.m. and a 550-ft. head.

Priming equipment consists of two 50-c.f.m. automatic priming pumps driven by 5-hp. 440-volt motors with vacuum breakers and other auxiliaries. Vacuum breakers are located at the pumps they serve, and the pipe supports also carry the gage boards for the respective units, on each of which is mounted the vacuum regulator and gage and the pressure regulator and gage.

Suction lines are 18-in. cast-iron pipe with bronze suction bells. The upper end of each suction line, a 10-ft. section of 18-in. bronze pipe, connects onto a special 18-in. plug valve to cut off the pump inlet in case it is necessary to open either unit when the water is above the intake level. Plug valves were selected for this purpose in preference to gate valves because they can be closed almost instantly and because the machined surfaces of a plug valve, not coming in contact with the water, insure tight closure. Special 18-in. Barrett-Haentjens bronze strainers are mounted in the suction lines between the plug valves and the pump inlets. The strainers are built on the streamline principle to reduce friction loss and flow disturbance, and are equipped with built-in air ejectors to prevent the upper part from becoming air-bound.

Discharge lines also are of 18-in.

extra heavy cast-iron pipe, each fitted with special Barrett-Haentjens all-bronze automatic check valve with electric contacts. Both discharge lines connect into a single 22-in. cast-iron wood-lined pipe (2-in. cast-iron walls and 1-in. wood lining) which extends from the pump-room a distance of 375½ ft. up the shaft. The remaining 108½ ft. of the shaft column consists of California redwood pipe with 3-in. walls and an inside diameter of 20 in. The redwood pipe connects to 1,800 ft. of Wyckoff wood-stave pipe which discharges into the Lackawanna River. The Wyckoff pipe has an internal diameter of 24 in.

Drainage for Shaft Dam

In addition to the main pumps, an auxiliary 250-g.p.m. centrifugal pump driven by a 15-hp. 440-volt motor is installed in the airway (see Fig. 1) to remove the water which collects on the shaft dam and which otherwise would rise into the pump-room. This unit, equipped with 8-in. suction and discharge lines, is designed for a 110-ft. head. Water handled by the auxiliary pump is discharged through the dam at the head of No. 11 slope and joins the main body.

To supply power to the pump station, the old transformer equipment, receiving current at 23,000 volts and delivering it at 2,300 volts, had to be transferred to the top of No. 2 shaft, where it could take care of both mine and pump load and would be close to the load center. Its capacity also was increased so that after the change it delivered 6,500 kva. Power is transmitted to the pump station by two 600,000-circ.mil 3-conductor 5,000-volt armored cables suspended in the pipe-and-cable compartment of the shaft and supported by American Steel & Wire Co. cable clamps. Both cables feed onto a common set of busbars in the pump-room, and from these, through gang-operated disconnects, to the main oil circuit breaker in the second of the four steel cubicles which house the control equipment for the station.

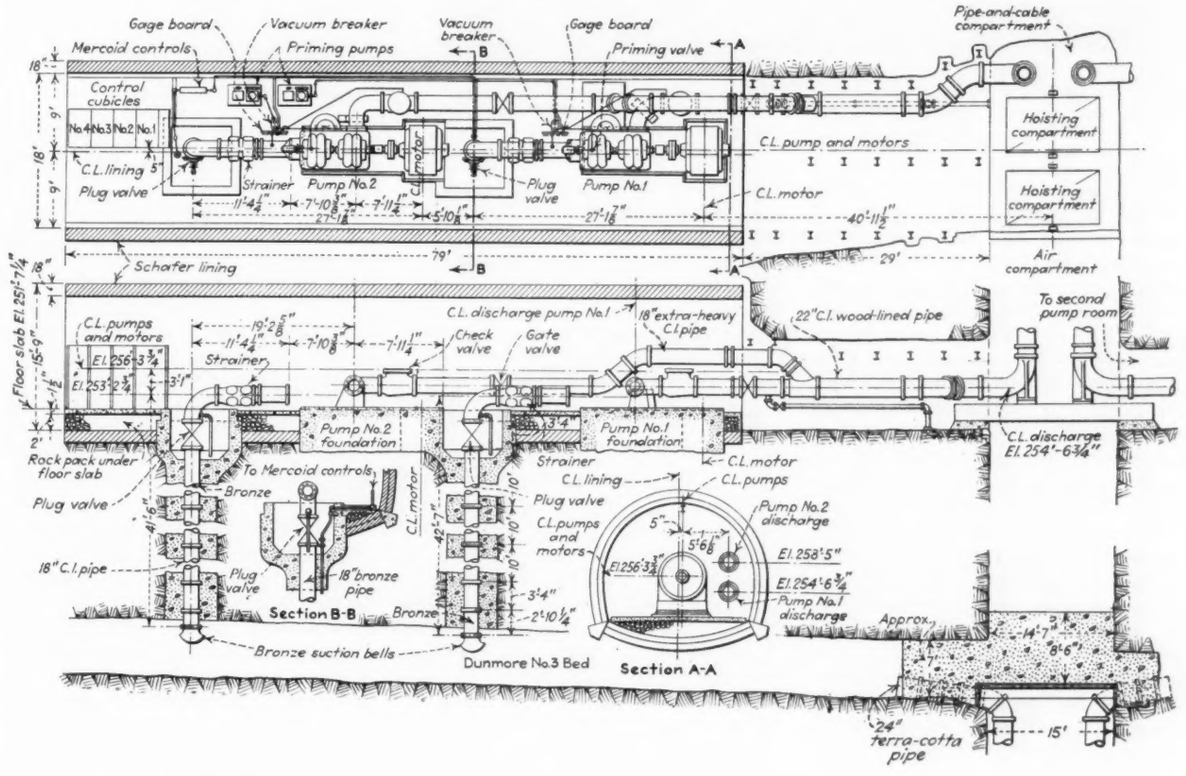
In addition to the necessary relay, metering and other auxiliary equipment, major starting and control equipment installed in the four cubicles is as follows: No. 1—Main incoming gang-operated disconnecting switches, auxiliary pump control and indicating equipment, also 25-kva. power transformer tapped for 440 and 220 volts for operating the auxiliary and priming pumps and the various control circuits, and a 7½-kva. single-phase transformer supplying the 110-volt lighting and alarm circuits. No. 2—Gang-operated disconnecting switch, main oil circuit-breaker. Nos. 3 and 4—Subsidiary gang-operated disconnecting switches, oil circuit-breakers and controls for No. 1 and No. 2 pump motors, respectively. To prevent arcing between the busbars and the switch contacts in the cubicles in opening the incoming line or the main motor circuits, switch-operating mechanisms are interlocked with the oil-circuit breaker trips so that the breakers open before any movement of the disconnecting switch contacts takes place.

Provision for Variant Level

Because physical conditions made a series of float switches to control the operation of the two pumps over the various stages from maximum suction head to maximum suction lift impracticable, Mercoid switches, operating on either pressure or vacuum, were installed. Each pump is equipped with a set of two switches, and the two are set for different pressure and suction limits to provide for the operation of either one or both of the pumps, depending upon the water level.

In addition to the protecting features, the control system includes suitable transfer switches for chang-

Fig. 2—New Marvine pump station. Plan view shows arrangement of pumps, controls and control piping. Sectional views show arrangement of suction and discharge piping. Location of shaft dam, complete lining ring and design of plug-valve vault



ing from manual to automatic operation, from suction-head to suction-lift operation, and for reversing the sequence in which the two pumps start, so as to equalize the operating time and consequent wear of the two pumps. With automatic operation, two forms are available: (1) continuous full-automatic operation after the starting impulse has been given, the pumps starting and stopping in the proper sequence in accordance with the water level; and (2) starting and stopping at predetermined times with a time clock, with full automatic operation within the time limits. When water-inflow conditions permit it, use of the time clock restricts operation of pumps to the off-peak period at night

Suction-head and suction-lift operations also are dependent on inflow conditions. Normally, when the inflow is comparatively light and fairly steady, the pumps can be operated under suction head to reduce the net discharge head. At times when inflow is normally heavy and sudden surges may be expected, the pumps are placed on suction-lift by throwing the transfer switch, whereupon both pumps operate continuously until the water is lowered to the suction-lift level. Thereafter, one or both pumps, as required, operate between the vacuum settings on the Mercoid switches.

Because the water level may change from suction head to suction lift at any time while the pumps are stopped, the control system at the Marvine pumping station, in common with those installed in a few other stations, has provision for starting the priming pumps every time the main pumps start, whether the water level is above or below the pump inlet. This is done by a special Barrett-Haentjens priming valve which is kept open only during the priming period by the action of the priming pump.

Furthermore, if the priming pump is started when the main pump is in motion, any water that may be in the pump casing will be thrown by centrifugal action into the vacuum-breaker float chamber, thus closing the vacuum-breaker contacts and starting the main pump. This is known as a "false prime." Hence, a time-delay relay is provided to insure that the main pump is at a standstill before the priming pump can start.

Protective features are included in the control system to take care of the following conditions: undervoltage and reverse phase; priming-pump motor failure; failure to prime; incomplete starting sequence; a.c. overcurrent; overheated motor windings of main and priming pump motors; overheated bearings; excessive vacuum; loss of pressure in discharge line; cessation of flow in discharge line; and simultaneous starting after power failure.

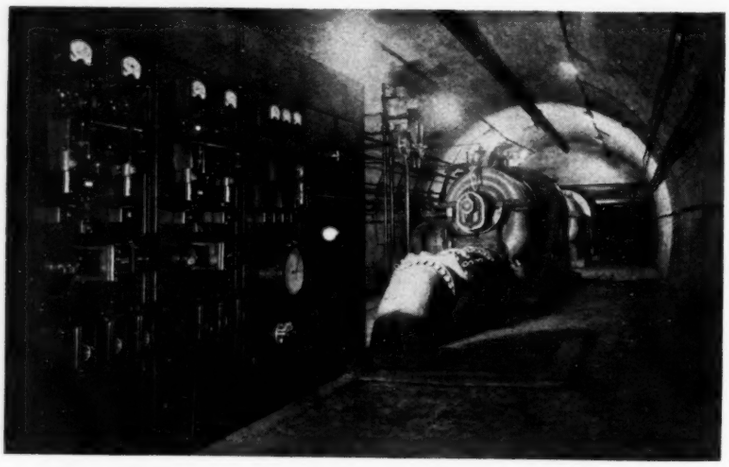


Fig. 3—Marvine pump station, with electrical control cubicles in left foreground. Vacuum breakers are located at their respective pumps and the supports also carry the gage boards

Against Break at Shaft Top

In addition, provision is made to prevent flood of the pumproom if the discharge line should break near the top of the shaft, a condition which might conceivably result in the failure of the pressure switch to operate, in which case the pumps would continue to run, filling the shaft and flooding the station. To forestall such a possibility, a float switch is located in the floor of the pumproom entrance to shut down the pumps.

The second pumproom, on the other side of the shaft, is planned to house two pumps of capacity equal to those in the original pumproom, but, thus far, only one unit has been installed. In this instance, it has been possible to rely on the rock measures to support the sides of the well drilled to the Dunmore No. 3 bed. Pump discharge goes to the surface in a separate 20-in. (interior diameter) cast-iron wood-lined pipe entering into a 20-in. (interior diameter) redwood pipe which connects in turn with the 24-in. wood-stave surface pipe already mentioned, where it joins with the water from the pumps in the other pumproom.

Capacity of Station Raised

On the installation of this second pumproom the capacity of the 23,000/2,300-volt surface substation was increased from 6,500 to 9,000 kva. The two cables for the two original pumps, which formerly were suspended in the shaft, were removed to provide space for the second discharge line and placed with a third cable of the same size in a 12-in. cased borehole from the surface to the second pumproom.

Similar electrical controls were provided with the third pump as with the two original pumps, including provision that, in event of power failure and restoration, the pumps would not all start at once but in their proper sequence. This provides against the excessive power peaks drawn from the system such as would accompany the starting of more than one pump of such size at the same time.

Pump Sequence Can Be Varied

Arrangements are made so that any one of the three pumps can be used as the "pilot pump" and that the order of operation of the three units can be varied so as to equalize wear. Ventilation is provided, as for the other pumproom, by a 5,000-cu.ft.-per-minute Buffalo Forge fan.

Practically no trouble has been experienced with corrosion. Impellers and casing, when originally installed in the new units, were coated with Valdura paint. After twenty months, some of the paint still remained and tool marks could be noted on the impeller. Lack of corrosion perhaps may be explained by the fact that the water stratifies more or less in accord with the contours of the sump, with the stronger acids tending to reach the lower levels remote from the entrance to the pump sections.

WHEN I MECHANIZE

+ How Can I Secure Maximum Results From My Loading Equipment?*

By EDWIN H. JOHNSON
Manager of Sales, Loading Machines
Jeffrey Manufacturing Co.

COORDINATION of machines, methods and men in mechanical-loading operations requires time study of the job from every angle, intelligent analysis of the findings, and prompt action to correct the indicated faults. The stop-watch is very useful to measure relative efficiency and is especially effective in uncovering defects which might otherwise go unnoticed.

These defects at first appear to be the delays and interruptions that are generally tolerated as part of the difficulties of any mining operation. Among this class of troubles are: roof falls, power failures, derailments, water, grades, cable splicing, haulage blockades, and mechanical and electrical failures in individual machines. While it is true that these defects are not completely avoidable, an alert management can do a lot to anticipate their occurrence and thereby minimize their harmful effects.

In making estimates of performance of face equipment in general, we assume that this group of difficulties will cost one hour of the available seven in a shift, even after the operation of new equipment has passed the introductory stage and become a run-of-mine routine. From analysis of time-study reports in a variety of new installations I have found that this item averages 73 minutes. It will sometimes be as high as two hours at times before the routine is well established. How far this class of delays can be reduced in practice is partly a function of physical conditions, yet mostly depends upon the competence of the face supervision.

Another factor developed by time analysis is the importance of the deficiencies in the coal seam itself. By this is meant the effect of seam impurities on the mining machine and drill, delays due to roof and bottom irregularities; also such delays in loading as result from close timbering and slate separation during the loading operation. As these conditions govern the system of mining and control the selection of new equipment, they should always be carefully analyzed in advance. However, their study after the equipment is at work can lead to further changes which may reduce the effect of existing faults.

A less apparent class of factors influencing the success of mechanical-loading installations is the balancing of capacities of the mechanical units and of the day-work crews. Suppose that a section of a mine produces 200 tons per shift with a crew of twenty men. If the addition of four men to this crew will produce 240 tons with the same equipment, the direct labor cost may be the same but there will be a saving due to higher output of machines. In each of the above cases the man-day tonnage is 10.

If the addition of one or more men will pull up the average man tonnage of the crew with the same equipment, this change will produce a double saving. But, if with more men it is necessary to add more equipment to get a higher unit tonnage for men and machines, then the problem becomes more complex. This balancing of capacities of the various units that unite to complete the operating cycle is especially difficult because the output of men and machines has to be determined by estimation for a mechanical routine some time before the routine can be established.

Frequently the change from hand to machine loading will increase the capacity of mining machines, drills and locomotives, because of the concentration of production in a smaller number of active working places. This is a distinct advantage from the standpoint of investment in track, timber and copper, and ease of supervision of face operations. At the same time this change is responsible for many of the difficulties that develop in the earlier stages of a mechanization program.

But concentration also will lead to congestion when proper allowances are not made for the resulting greater frequency of haulage trips. A delay of a few minutes may interfere with the performance of every mechanical unit in a section. Frequent derailments at one point can be overcome by fixing the track. Another haulage delay occurs because the loaded cars have the empties blocked, or the mining machine is moving, or the main-line motor trip is late. Delays of this class are more serious because they are likely to be disregarded as inevitable. There may be some simple solution, but the fault also may be deep-seated, going all the way back to the original planning.

In the panel system generally employed in Illinois mines, rooms are turned in both directions from a set of panel entries. In hand-loading operations, as many as 50 or 60 rooms might be turned from a single

*An address originally entitled "Coordination in Mechanical Mining," delivered before the Rocky Mountain Coal Mining Institute, Denver, Colo., May 31, 1937.

pair of panel entries. A gradual change has occurred in these projections with the advent of machine loading. The number of active rooms has been reduced and the number of panel entries has increased to three and in some cases to four. Where 16- and 20-lb. steel rails were once used the present average weight of rail in producing sections is 35 lb. per yard. Steel ties are most often used in rooms. Many inside room switches are used in crosscuts to provide for car shifting.

Some of the machine-loading mines are now using the "key-room" system. The key-room plan reduces the switching distance for the car change, reduces the tramming distance for the mobile units, and eliminates more than half of the switches on the panel entries. After the rooms have been driven past the first crosscut, two or three rooms are picked up from the key-room and the outby track to the entry is removed from the other rooms. The pick-up points are advanced about every second crosscut. This plan requires some extra track labor, but pays good dividends in time saved for the production units. Of course, the original idea in this plan is to divert as much traffic as possible from the panel entries.

For a mobile machine-loading unit in a section manned by capable miners and bossed by a smart foreman, the following division of time is nearly ideal:

Loading.....40 per cent, or 168 minutes
Car changing.30 per cent, or 126 minutes
Tramming....15 per cent, or 63 minutes
Delays.....15 per cent, or 63 minutes

Recently one of our customers hung up a new single-shift record for single loader performance, and the explanation of this record is found in the percentage distribution of time as compared with the foregoing schedule. Car changing occupied 27 per cent of the shift, with a change in an average of 59 seconds. The loader made 18 moves in 54 minutes, which was 13 per cent of the day. Delays accounted for 45 minutes, which was 11 per cent. The machine loaded coal during the other 208 minutes, which was 49 per cent. This loader was handling coal at an average rate of 3.6 tons per minute throughout that time. Keeping the loader busy 49 per cent of the day increased the man-day tonnage of the crew nearly 7 tons per man above what it is when the loader operates 40 per cent of the shift. On that particular shift the output per man for coal delivered in cars at the sidetrack was more than 34 tons.

An interesting sidelight of this performance was the surprise of the mine management that production of this order was possible. The mine car holds less than 2.5 tons and, although the loader was able to load two cars at a time, only one locomotive was used for gathering. Under this plan the loader was loading less than 30 per cent of the shift, with the gathering locomotive working to the limit of its capacity. The addition of a second gathering locomotive, while reducing gathering efficiency, added about 40 per cent to the effective loading time, with considerable reduction in operating cost.

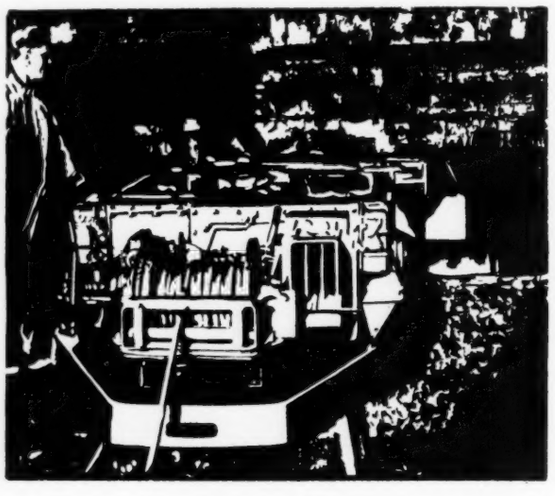
Contrast this with the experience of another company that made a time study of the operation of one of our loaders continuously for a period of two weeks. At the end of this time, I was advised that our machine would have to load 100 mine cars per shift before the purchase of more loaders could be recommended. We were able to show by their own figures that the average time required for change of cars behind the loader was four minutes. Individual car changes were often less than a minute, but the gathering locomotive had to wait 15 to 20 minutes for the haulage motor every time that it went to the sidetrack. The time-study record was complete and in proper order, but someone forgot that such a record is of no value unless it is used.

Probably the highest degree of refinement in mechanization is to be found in the mines of two coal companies in southern Illinois. One company uses track-mounted cutting and loading machines and the other uses shortwall cutters and caterpillar-mounted loaders. I have made time studies in these mines, and each company employs engineers regularly for this purpose. In one company the average proportion of loading time is 42 per cent. In the other company the average is 43 per cent for loading time, and this company has an average car-changing time of 26 seconds, which probably is the best in the country.

Performance of this order is being achieved because these companies in the first place have done what was necessary to provide and maintain a reliable roadbed for their rolling stock, to provide adequate power at full voltage, and because they are providing the best in face preparation for loading equipment. There is, however, another reason for this success. The proudest possession of these companies is their group of section foremen. The vital spark that distinguishes remarkable results in mine mechanization from the hit-or-miss, run-of-mine average, is that spark plug in the section usually called the face boss.

It is possible to get really eloquent about the face boss. Your good face boss is the real coordinator in mechanical mining. He is careful of men and machinery. At the same time his eye is always on the main theme: to get out more coal, cleaner coal and better prepared coal. He is alert and resourceful, anticipating the delays before they happen. He is proud of his men, his machinery, his record and even of his section. He can make or break the machines and the coal company.

There is almost always good face-boss material available, but the training of men for these jobs is a slow process requiring tact and patience. And the penalty for a wrong guess may be pretty high. The process of selection and training of personnel for these bossing jobs undoubtedly is the most difficult problem that must be solved in building a mechanical-loading cycle into successful performance.



ATLAS STRIPPING

+ Employs 4-Yd. Walking Dragline In 30-Ft. Average Overburden

WITH RESERVES of 1,000,000 tons ahead, the Atlas Coal Co., Inc., is now engaged in stripping a 5- to 7½-ft. seam with a 4-yd. walking dragline six miles south of Oskaloosa, in Mahaska County, Iowa. Coal is loaded with a 1- or a 1½-yd. shovel, or both, although one unit usually is held in reserve, and is hauled to either a truck tipple or a railroad loading tipple in 5-ton end-dump trucks, which also are used to make deliveries to near-by consumers. Overburden thickness averages slightly less than 30 ft. Rated capacity of the operation, which began distributing coal in September, 1936, is 1,000 tons per day. At the time this article was prepared, March 1, 1937, as high as 900 tons had been shipped and trucked out in a single day.

The Atlas acreage, which was prospected with drillholes on 150-ft. centers, consists of an approximately rectangular tract to the east of Highway 139, with a smaller tract to the west of the road opposite and extending past the north end of the larger tract. Both tracts are between the old Muchakinock and Pekay deep-mine fields on Kennebec Creek. The tracts are cut by gullies and ravines, leaving the coal in the hilltops. Maximum thickness of the overburden on either tract is 50 ft., decreasing to about 8 ft. at the outcrop. The average, as noted above, is slightly under 30 ft.

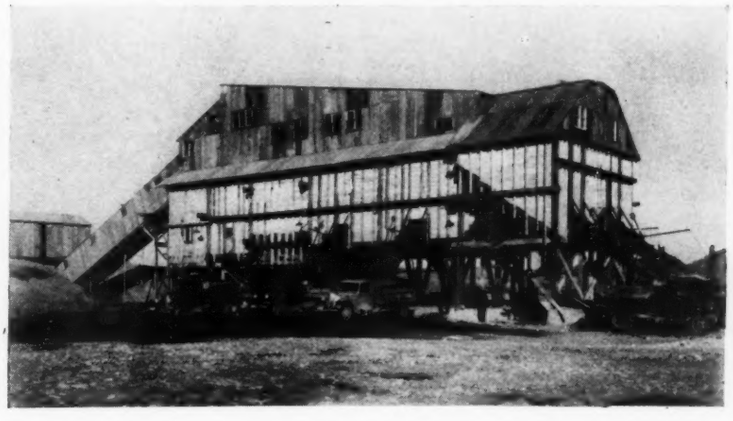
Beneath the seam is a fireclay which disintegrates readily when wetted. Above the seam, as a rule, is 6 to 25 ft. of dark slate. Normally, the overburden can be removed without shooting, except that occasionally from 2 to 4 ft. of material directly over the coal becomes too hard to dig, in which case it is drilled with the air drills used in coal and shot. Up to March 1, 1937, in moving close to 100,000,000 cu.yd. of overburden, it was found necessary to shoot only approximately 10,000 cu.yd. As stripping proceeds, according to test-hole information, more of the hard stratum will be encountered. The coal is hard in structure and is clean with the exception of some sulphur lenses and numerous sulphur-bearing sandstone boulders, many running up to 500 lb. or more in weight.

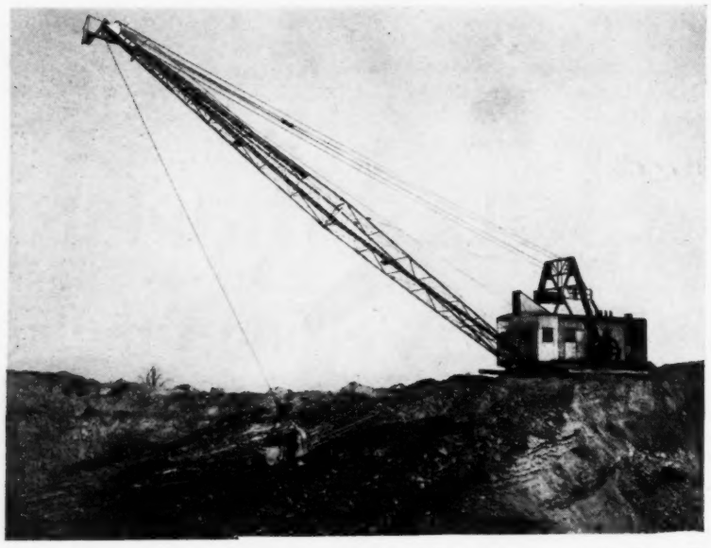
Stripping is done by a Bucyrus-Erie 5W walking dragline with 4-cu.yd. bucket and 110-ft. (with 20-ft. extension) boom capable of stripping to a depth of 50 ft. The boom installed on the shovel was an outgrowth of the experience of F. D. Lanning, president of Atlas, and his associates in laying pipe lines. It consists of split H-sections and seamless-steel pipe, the whole welded together. Greater rigidity with no increase in weight was the major objective, in addition to reduced maintenance and longer life. The bucket used also was modified to make it dig better. This involved welding an auxiliary strap all the way around the arch, this and other construction adding a total of 1,100 lb. of weight on the front end.

Pit width at Atlas normally is 100 ft. measured on the coal. The dragline works from the top of the bank, and in fact partly on the solid overburden and partly on spoil dumped ahead against the bank. While this involves rehandling of some of the spoil as the unit moves along the line of the bank established by the excavation for the previous cut, it also places the dragline in a better position for either casting or digging, experience has shown. Large refuse left after the dragline has passed is pushed either into the spoil or up to a point where the excavator can pick it up, using a Caterpillar 45 diesel tractor with Laplant-Choate bulldozer with 9-ft. blade. This unit also is used in road making and miscellaneous dirt-moving operations.

In cleaning off the top of the coal, the bulldozer work is completed by hand shoveling, the use of wire

Atlas truck tipple. Lump bins are on the right-hand end.





Stripping at Atlas is done by a walking dragline with 4-cu.yd. bucket. In this picture, the unit is engaged in taking out an island of overburden left from previous excavation at a point where the pit makes a right-angle turn.

brushes and, occasionally, blowing with compressed air. Coal and such rock drilling as is encountered are handled by a 110-c.f.m. gas-driven Sullivan compressor and two Sullivan pneumatic drills. Drill steels are equipped with Timken rock bits. Holes for shooting coal usually are placed 6 to 8 ft. apart and are loaded with Blackstix or C powder with a Blackstix primer. C powder is employed when a greater yield of chunk coal is desired for the truck tipple. All holes are fired electrically. The coal-loading units, both gasoline-driven, consist of a P. & H. shovel with 1-cu.yd. dipper and an Osgood shovel with 1½-cu.yd. dipper. Normally, only one is in use at a time, the other constituting a spare.

The main truck road from the pit now being worked is built out on the bank on the opposite side of the pit from the spoil ground. Runways normally are placed to lead into the ends of the pit, but, where conditions make it desirable, a runway may be cut down the bank at a point between the two ends. Where possible, the work is arranged so that the trucks used to haul the coal operate on the bottom, in which case all the coal is taken the full width of the pit. Only where economically unavoidable are the trucks operated on a coal berm, as such operation adds to the difficulty of keeping the top of the seam clean.

Keeping the pit dry is based on the construction of a drainage ditch out in front to carry most of the surface water to the creek. Consequently, only a relatively small quantity of water must be handled in the pit. For the latter purpose, two gasoline-powered Gorman-Rupp self-priming centrifugal pumping units (one 3 in. and the other 5 in.) are installed. Discharge lines from the 3-in. unit are made up of ordinary screw-jointed pipe. Light riveted pipe is used for the discharge line from the 5-in. pump.

To enable the mine to serve, in addition to local consumers, State institutions, utilities and similar purchasers of steam coal, a rail tipple has been built on the Rock Island railroad about one mile away from the main truck tipple. A crushed-stone road to this tipple was built by the coal company. The rail tipple is designed primarily for the production and loading of 2-in. screenings from mine-run coal trucked directly from the pit. From a dump hopper the coal is discharged onto a picking conveyor which carries it to a single-roll crusher adjustable for crushing to 6 in. down to 2 in. From the crusher a scraper conveyor carries the coal up to a loading chute over the railroad siding.

The main tipple (truck loading only) is equipped with a picking table, shaker screen, Hum-mer vibrator and auxiliary crusher for making, in addition to crushed coal, the following primary sizes: lump, 6x3, 3x2, 2x1, ¾x¼ stoker, 1⅝ steam and hand-picked mine-run. Stoker is made on the vibrator, and the auxiliary crusher, of the adjustable type, is stationed under the shaker screen, where all sizes above 1¼ in. can be run to it for reduction. Plans have been made for installing a chute from this crusher to the vibrator so that when all coarse-coal bins are full the crusher and vibrator can be run for the production of stoker and residual sizes.

The shaker screen at Atlas also is made to serve as a distributing chute by extending the non-screening length. With non-screening extensions, the unit reaches from the end of the picking table to the lump bins, which are at the opposite end of the structure. Two lump bins are installed and the coal off the end of the upper deck of the screen is placed in the bins by a scraper conveyor which can be raised and lowered by a boom hoist and also can be swung from one side of the bin structure to the other. The shaker screen also spans ten other loading bins for the other sizes made. These bins are built in pairs so that five are lined up on each side of the shaker center line. The various sizes of coal are directed to the appropriate bins by

General view of the pit at Atlas mine, with the stripping unit in the background. Trucks temporarily are being loaded on the coal, whereas normally they operate on the bottom. Drilling and brushing operations are shown at the right.

gates in the shaker decks. These gates also permit making combinations of more than one size when desired.

Total bin capacity is 400 tons and twelve trucks can be loaded simultaneously from the twelve bins. Truck shipments are weighed on a double-dial Fairbanks scale, which also is used to weigh coal destined for railroad shipment. Plans are under consideration for installation of an oil system for dustproofing all sizes shipped from the truck tipple.

Power for the operation of the truck and railroad tipples and also for lighting and miscellaneous loads is generated in the company's own steam plant. This plant consists of one 125-hp. hand-fired boiler operated at a working pressure of 110 lb. per square inch gage, and one 240-amp. 240-volt (full-load) engine-driven a.c. generator. Any handy size or mixture is fired under the boiler. The engine exhaust is run to an old boiler shell to preheat the feed water. Soft spring water, obtained close at hand, is largely used for boiler feed. The entire generating plant, located at the truck tipple, is operated by one man. The rail tipple is served by a pole line in which the poles consist of used 6-in. steel pipe.

STOKER COAL PLANT

+ For Consol's Millers Creek Operation Completes Preparation Improvements

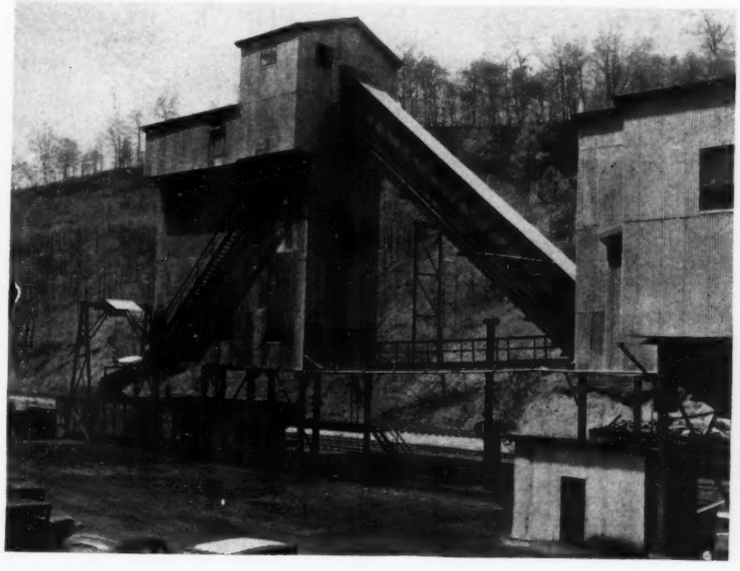
PREPARING uniform stoker coal of any specification is the principal duty of a 120-ton-per-hour screening, blending and loading plant put into service in October, 1936, to round out facilities of the modern and comparatively new tipple of the Consolidation Coal Co. at mine No. 155, Van Lear, Ky. Steel and concrete construction, surge and storage bins equipped with coal-lowering devices, horizontal double-deck screens which reduce height, adjustable gate openings to mixing feeders of the constant-speed belt type automatic stops to forestall improper mixtures and oil sprays at six points are features of the design.

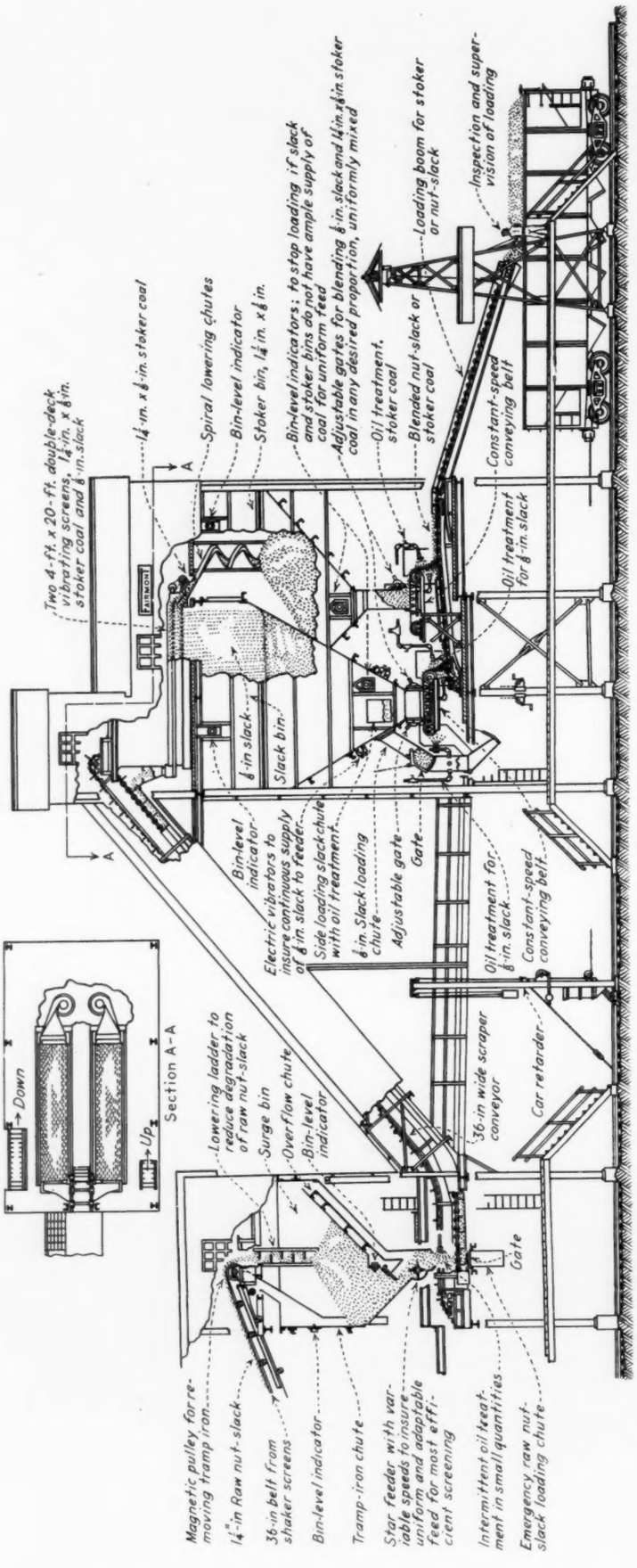
Mine No. 155 is close to the northeast corner of the Big Sandy field and is in the Millers Creek seam, noted for its blocky premium domestic lump. The coal is a free-burning type containing about 35 per cent volatile matter and 3 per. cent ash. Approximately 28 per cent of the mine output falls in the 1¼x0-in. fraction, and of this, 47 per cent (9 per cent of the mine output) is minus ⅛ in. in size.

The mine plant was modernized in 1935 by a slope conveyor and a 600-ton-per-hour four-track concrete and steel tipple designed and built by the Fairmont Machinery Co., which also handled the stoker plant. The new tipple and other plant improvements were described in the October, 1935, *Coal Age*, p. 413. Among the units of the new tipple was a 54-in. x 19-ft. (centers) nut-slack elevating belt conveyor with magnetic head pulley which discharged through an oil spray box and onto a 48-in. apron-type boom having a 6-ft. horizontal section and a 32-ft. hinged section; the complete unit was utilized in the design of the new plant. In effect, the new plant was interposed between this nut-slack belt and the boom.

The new construction begins with a 50-ton surge bin and star feeder in a small addition to the existing tipple and the remainder of the equipment is in a new building spanning the slack track and connected

The stoker-coal plant was built over the slack track




Two 4-ft. x 20-ft. double-deck vibrating screens, 1¼-in. x ⅜-in. stoker coal and ⅜-in. slack
1¼-in. x ⅜-in. stoker coal
Spiral lowering chutes
Bin-level indicator
Stoker bin, 1¼ in. x ⅜ in.
Bin-level indicators; to stop loading if slack and stoker bins do not have ample supply of coal for uniform feed
Adjustable gates for blending ⅜-in. slack and 1¼-in. x ⅜-in. stoker coal in any desired proportion, uniformly mixed
Oil treatment, stoker coal
Blended nut-slack or stoker coal
Loading boom for stoker or nut-slack
Inspection and supervision of loading
Constant-speed conveying belt
Oil treatment for ⅜-in. slack
⅜-in. slack
Slack bin
Bin-level indicator
Electric vibrators to insure continuous supply of ⅜-in. slack to feeder
Side loading slack chute with oil treatment
⅜-in. Slack loading chute
Adjustable gate
Gate
Oil treatment for ⅜-in. slack
Constant-speed conveying belt
Section A-A
Down
Up
Lowering ladder to reduce degradation of raw nut-slack
Surge bin
Overflow chute
Bin-level indicator
36-in wide scraper conveyor
Car retarder
Gate
Magnetic pulley for removing tramp iron
1¼" in Raw nut-slack
36-in belt from shaker screens
Bin-level indicator
Tramp-iron chute
Star feeder with variable speeds to insure uniform and adaptable feed for most efficient screening
Intermittent oil treatment in small quantities
Emergency raw nut-slack loading chute

The use of horizontal screens made it possible to arrange the equipment in a building which stands but 76 ft. from rail to ridge of roof

to the tipple addition by a scraper conveyor gallery and an overhead walkway. The nut-slack elevating belt conveyor mentioned in the preceding paragraph was extended to discharge at the top of the surge bin and its original "Stearns" magnetic tramp-iron-separating drive pulley is utilized in the new position above the surge bin. The loading boom was moved to a position at the lower end of the new building and its horizontal section extended to fit in a design whereby the boom receives coal from two belt feeders.

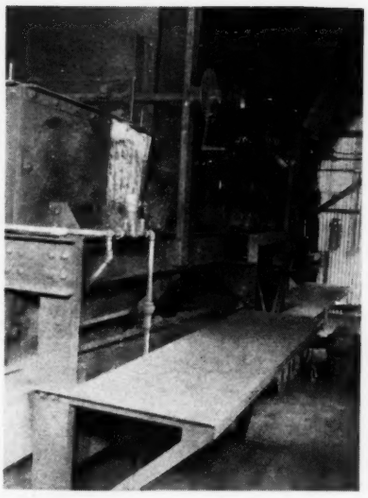
At present the feed to the new plant consists of 1¼-in. raw nut-slack and this is separated into 1¼x⅛-in. stoker and 1⅛x0-in. resultant. These sizes can be shipped separately or can be mixed to any percentage specification. For the most part the 1⅛x0-in. shipments go to steam plants which use pulverized fuel.

The screens are 4x20-ft. Symons horizontal vibrators each having two decks fitted with rectangular-mesh wire cloth stretched to a high tension. Openings are ⅜x4 in. in the upper deck and 1/10x4 in. in the lower. These screens are designed to give a positive action regardless of deck load and are balanced by vibrating deck rails of 3x6-in. solid steel, one on each side, equal in length to that of the screen frame. Individual drives are used and each consists of a 10-hp. General Electric 1,740-r.p.m. fan-cooled totally inclosed induction motor with V-belt connection. Because the driven pulley vibrates with a part of the screen mechanism the duty on the belts is severe, but no difficulty is encountered. Six 9/16-in.-wide Gilmer belts are used.

Level Screen Lowers Tipple

Construction advantage of the horizontal screen is indicated by the fact that the total height of the building from railroad track to ridge of roof is but 76 ft. and that height affords ample space for a 60-ton stoker bin, a 120-ton slack bin and the respective mixing feeders, oil treating boxes and the boom—all without any secondary elevating equipment.

Degradation is guarded against by a lowering ladder in the raw nut-slack surge bin and by a spiral lowering chute in the stoker bin. On each side near the bottom of the slack bin is installed a Syntron electric vibrator to loosen the fine coal and insure a continuous supply to the 32-in. (belt) mixing feeder. Further insurance against faulty mixture is maintained by "Bin-Dicators" installed near the bottoms on the two bins. In case



Adjustable gates, belt feeders and oil-treatment boxes above the horizontal section of the loading boom

either bin becomes practically empty, a control circuit switch in the "Bin-Dicator" automatically stops the two belt feeders and the loading boom.

Six of these contact-operating level indicators (made by the Bin-Dicator Co., Detroit, Mich.) are used in the plant, one positioned at the high level and one at the low level of each of the three bins. Signal lamps mounted at eye level above the car trimmer's platform serve as visual signals of full or empty bins, thus informing the operator as to the reason for a stop and also indicating when to restart. Motor controls are connected for sequence starting and all buttons are grouped on a desk-type control board on the trimmer's platform and protected by a weatherproof case with hinged and locking cover.

Possibility of damage to the 26-in. main belt conveyor in the remote chance of failure of the automatic stop and consequent overfilling of the surge bin is eliminated by inclusion of an overflow chute in the design. A gate in the bottom of the main scraper conveyor at a position directly below the discharge of the surge-bin star feeder provides an emergency loading point for the raw nut-slack, thus permitting regular operation of the tipple with the stoker plant shut down.

The belt feeder at the bottom of the slack bin is reversible and so can be used to deliver either to the boom for mixing or to a direct loading chute. Also, slack can be loaded directly from the bin by two other chutes, one leading straight down to the slack track and the other to one side for emergency loading onto the stove track of the main tipple. Both chutes contain oil-treatment boxes, but if oil-treated slack is to be loaded it will be handled over the belt feeder because the thin curtain of coal dropping from the wide feeder affords an excellent opportunity for the hot oil vapor to coat all particles.

As an aid to screening, a small quantity of oil is applied intermittently during the day to the minus ¼-in. raw nut-slack going to the stoker plant. This limited quantity of oil, applied at the star feeder, has a tendency to prevent blinding.

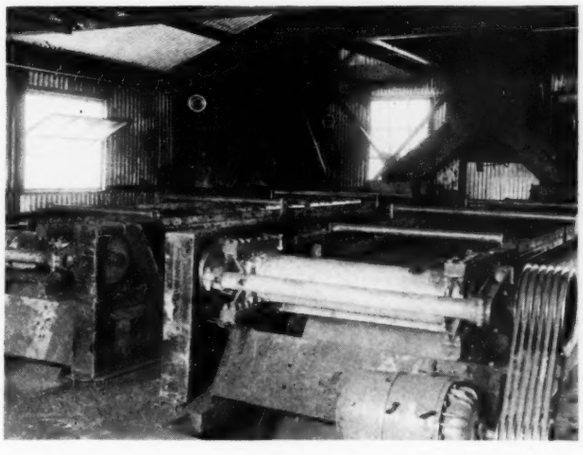
The Viking hot-vapor process in combination with a circulating system is used for the dustless treatment. The tipple was thus equipped when built and the new job represents but an extension of the original. Oil flow to the nozzle groups of the 1¼x⅛-in. and minus ⅛-in. belt feeder discharge boxes is controlled by a solenoid valve which is interlocked with the boom motor starter. The stoker-coal belt feeder is 50 in. wide and both chutes delivering to the respective feeders contain deflectors and plows to distribute the coal evenly across the entire widths of the belts.

Not counting the boom hoist, the new plant contains seven motors totaling 80 hp. Two of these, both 10-hp. sizes (one equipped with disk brake and driving the main belt through a V-belt connection and the other driving the loading boom through a Cleveland worm gear, were moved from their original positions in the tipple. The largest of the new motors is a 30-hp. unit driving the 36-in. scraper conveyor through a Jones reduction gear. Speed adjustment of the star feeder is afforded by a Link-Belt "P.I.V." positive, infinitely variable gear. Its drive is a 5-hp. motor and the intermediate connection is a V-belt. All motors are 220-volt General Electric units.

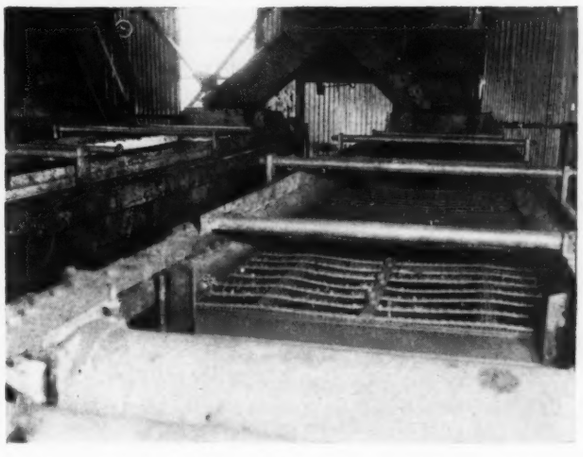
Lamp arrangement in the plant is designed to overcome the common difficulty of deficiency of light on the sides and under the overhanging parts of the equipment. One-hundred-watt lamps in General Electric flood units mounted on the walls 8 to 10 ft. from the floor direct the light to the best advantage.

Structural design of the building and plant follows that of the tipple in that no wood is used and low maintenance was the consideration put next to performance. Walkways and stair treads are "Electroforged" steel gratings furnished by the Blaw-Knox Co. Siding and roofing of the building are corrugated galvanized steel (not less than 2 oz. per square foot), the former No. 24 gage and the latter No. 22 gage.

Two 4x20-ft. horizontal double-deck screens operate in parallel. Safety guard over V-belt drive, right, was removed temporarily for photographing. Note floodlights in background



Upper decks of the horizontal screens are covered with wire cloth having ¼x4-in. openings and the lower decks with the same type of cloth with 1/10x4-in. openings for separating out the fines



NOTES

From Across the Sea

TWO KINDS of silicosis are to be found in the coal regions, according to T. David Jones, professor of mining, University College of South Wales and Monmouthshire, addressing the South Wales Institute of Engineers. (This Dr. Jones is not to be confused with W. R. Jones, who propounded the much-discussed theory that sericite, sillimanite and tremolite have at least a part in causing silicosis, *Coal Age,* April, 1934, pp. 142-143.) Those two types of silicosis are termed by Dr. T. D. Jones the genuine or classical silicosis, which occurs where men work in rock containing high percentages of free silica and usually, if not always, end in contracting phthisis (tuberculosis) with fatal results in a few years, and the "official," certified or alleged silicosis, which attacks men who have not been exposed to any other rock dust than that of coal shale or clay and who do not develop phthisis.

Classical silicosis can be diagnosed or detected clinically without the aid of X-ray pictures of the lungs, but the other silicosis requires both clinical and X-ray examination and a study of the industrial or working history of the patient to determine the presence of the disease. This latter form of silicosis, Dr. Jones said, is caused by breathing dusts which are physiologically harmless to healthy persons.

South Wales has most of the British cases (147 out of 169 fatalities, 511 out of 581 total disablements, and 198 out of 237 partial disablements between June, 1931, and the end of 1935). Of the 856 certified cases in South Wales, 552 were in the Swansea division, with 40,357 men underground, and 304 from the Cardiff division, with 80,600 men below ground. At the end of 1934, the anthracite mines of the Swansea division had 90 per cent of the cases in that area.

Bronchitis Road to Silicosis

Bronchitis appears to be the cause of the greater prevalence of the cases in the Welsh anthracite mines. It has been found to cause most of the absenteeism from work, to occur mostly in the first quarter of the year, to lay off the men affected two to three weeks and to be most common in collieries when men leave the mines riding in man-trips, or "spakes," drawn up the slopes in which they work.

Bronchitis, declared Dr. Jones, takes a usual toll of miners over 65 years of age in England and Wales, a specially heavy toll in South Wales and a still heavier toll in the shires, or counties, where anthracite is mined. Thus, in the years 1921 to 1923, all occupied and retired civilian males exceeding the age of 65 lost 11.4 in every 1,000 in England and Wales; all underground coal miners, 15.6; all underground Glamorganshire and Monmouthshire coal miners who work in bituminous collieries, 19.0; and all underground Carmarthenshire, Breconshire and Pembrokeshire coal miners who work in anthracite mines, 37.9.

Out of 532 cases, only 63, or less than 12 per cent, were of men who at some time had worked in rock headings, not that working in such headings is less causative of silicosis than work elsewhere but because only 200 men are now so engaged. Thus the incidence for these men would be 30 per cent and only 2 per cent for all employed in anthracite collieries if it were not for the fact that the 63 men probably included many not at present at work in rock headings. On the other hand, for every million persons in the whole country in 1930 to 1933 inclusive, 904 died from tuberculosis; in the urban districts, including some collieries, 864 died; in the rural districts including few or no collieries, 993 died, and in Ammanford, with many collieries, 654 died per million. Though real silicosis is followed by a marked increase in deaths from tuberculosis, less of that disease occurs among miners than among other persons. Many medical experts believe that coal dust retards tuberculosis.

Why in Anthracite Mines?

Wherein do anthracite mines differ from other coal workings? (1) Anthracite workings are not rock-dusted; (2) fewer rock headings are driven; (3) fewer compressed-air hammer drills and picks are used; (4) face temperatures are lower; (5) more explosives are used at the coal face during working shifts; (6) man-trips on inclines are more generally used; (7) less dust is present in roadways, as rock dust is not used. Ventilation is about the same in both classes of mines, and the strata worked contain no more free silica, and if anything less, than those of other South Wales districts.

His own investigations, asserted Dr. Jones, show that a mine using a large quantity of explosives per ton has a low incidence of silicosis and one having a low consumption has a high incidence. No connection between silicosis and explosives seems to be in evidence, despite the findings of the Banting Institute in Toronto, Canada, which found that inhalation of nitrous fumes with silica dust immensely increases the formation of the fibrotic nodules characteristic of silicosis; but under dry conditions nitrous fumes are not considerable and in any event do not last long even where no air is circulating.

All the spakes, declared Dr. Jones, travel over half a mile and the time of passage usually is 20 minutes. The men sit facing the foot of the slope and, where the road they travel is an intake, ride with their backs to the incoming air current. In the winter, the temperature change to which they are subjected may be 40 deg. F., and the air travels between 1,000 and 2,000 ft. per minute and even faster around the spakes, which also are traveling against the air current.

Nearly seven times as many claims for silicosis are made where spakes are installed as where they are absent, and almost eight times as many silicosis cases are certified. In anthracite mines, the men work fairly well clad, as the mines are not hot. Their clothing becomes saturated with perspiration. When they leave the mine they throw on one or two garments, usually only a coat. In the hot bituminous mines, men wear little or no clothing to accumulate sweat, and when they come out have a complete dry change. Thus, the coolness of the anthracite mines makes conditions worse, not better. Unfortunately, perhaps, it may be added, the Miners' Welfare Fund has shown a preference for placing washhouses at hot mines first. Perhaps Dr. Jones' article will convince them that in some cases the cooler mines should have precedence.

A man with true silicosis is a pathetic case, said Dr. Jones; he dies within five or six years, but a man with the alleged silicosis in many cases has every prospect of living to a ripe old age. Provision should be made for him, but the Welsh National Memorial Association ministers only to those who have tuberculosis, that being part of the terms of its incorporation. It has declared, however, that others who have silicosis without tuberculosis also need such care. Dr. Jones would have all men when traveling in spakes protected by a cowl, have the man-trips provided with hoods and run on return airways wherever possible.

In discussion, F. L. Jacob, who presided, declared that apparently "much which now passes as silicosis was formerly known by the more homely name of bronchitis." Three forms of fibrotic dust diseases occur, declared Prof. S. L. Cummins—silicosis, anthracosis and silico-anthracosis—the last an intermediate of the other two. With partial silicosis, dusts from coal and slate, normally inert, become dangerous, because they accumulate in pulmonary tissue.

Tuberculosis Often Present

Tuberculosis is not always discovered, even when present. When the sputa of 100 old retired miners were examined, 6 per cent of the tests showed tubercle bacilli. Dr. P. K. Sen, at Cardiff, Wales, he added, found from the sputa of 100 miners with pneumoconiosis that 12 per cent were similarly infected. Yet, Dr. Sen found in most of these men no marked constitutional disturbance, perhaps because coal dust absorbed the active toxic principle of tuberculous foci.

Only with X-rays could the so-called classical silicosis be diagnosed in its

earlier stages, declared Prof. A. H. Coxe. As Dr. P. Heffernan remarked, some advanced cases could be diagnosed by the policeman on the beat, but some men with radiological signs of classical silicosis live to old age, because their condition is not complicated by bronchitis, tuberculosis or other pulmonary disease. Seeing that Dr. Leroy Gardner, of this country, had found that gypsum dust inhibited the action of silica in experimental animals, he recommended its use in coal mines.

"Damaged goods" was a title applied by the schools medical officer for Carmarthenshire to 20 per cent of the children entering school, said Dr. T. W. David. Such boys are potential pseudo-silicotics and should not be allowed to enter coal mines. He laid stress on physical education and training for boys and on the importance of pit-head washhouses.

Long-continued exposure to low concentrations of nitrous fumes might aid in breaking down the power of eliminating dust. Sericite, said Dr. W. R. Jones, is found in greater proportion in flying dust than in the parent rock. He added that the relation of bronchitis to silicosis has not been proved. He had found that with a light apparatus that covered mouth and nose and admitted clean, fresh air under nose and mouth, men could work without undue interruption at drilling, ripping, etc.

Damage from bronchitis, tuberculosis, imperfectly resolved pneumonia and other chest diseases dating back to infancy predispose persons to silicosis, asserted Dr. C. G. Gooding. That damage is not always symmetrical. A post-mortem of an extensive tuberculosis with massive fibrosis of one lung showed the other lung only "shop soiled."

Danger From Low Resistance

Intermarriage, more prevalent in Swansea than in, say, Cardiff, where an influx of workmen from other areas has occurred, reduced the resistance of the inhabitants of that area to disease of all kinds, injected W. T. Woods. For a long time, the miners refused to permit shutters to be placed on spakes. They refused to wear the special waistcoats he had provided or the hoods for head, back and chest. His men had declined to ride in curtained spakes.

In one colliery, instanced George Roblings, men walked from their work along a duplicate of the road that Dr. T. D. Jones had visited, but many had developed silicosis and its variants. In his collieries, with a difference in temperature of 44 deg. F. between face and slope on cold mornings when men were being raised, the only cases of silicosis were those of two or three members of the staff (foremen and shotfirers). This made him skeptical of the spake theory.

Many boys who have been under supervision during the school period, because of chest weakness, recalled C. J. Davies, have been allowed to apply for work at the mines without notification of the management. He thought the schools medical system should not issue certificates to such boys.

Gudjonnson and Becke (*Journal of Industrial Hygiene,* April, 1936), said A. Shaw, showed that of 300 granite-quarry workers, over half could be classified by X-ray examination as having some degree of silicosis, though only seven were held to be suffering from a severe type of the disease. Yet, they state that among these workers tuberculosis was rather rare, and they conclude that tuberculosis is no more rife among silicotics than among those not so afflicted.

Roof-shale analyses in the anthracite area show that these shales have the lowest free-silica content of any coal-measure rocks he has examined—about 20 per cent—though it might rise to 40 per cent in the higher rippings. Roadway dust contains sometimes only 10 per cent of free silica because 60 per cent or more is coal dust. Free silica, sericite and coal dust are common to all anthracite collieries, yet Dr. D. T. Jones has shown that cases of disablement are concentrated in collieries with spakes. He therefore regards the spake as the culprit.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Orders for all books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

Possible Recovery of Coal From Waste at Illinois Mines, by C. M. Smith and D. R. Mitchell. Engineering Experiment Station, University of Illinois. Bulletin 285, 44 pp. Price, 50c.

With a substantial increase in the relative quantity of waste from the cleaning plants, mechanical loading plants and strippings of Illinois the authors believe it is time to introduce methods of recovery of the marketable values in such waste, which amounts to 2,000,000 tons annually if the material wasted in the mine be included. Perhaps a third of this, or 700,000 tons, is recoverable. They estimate the value of this waste at $1.50 per ton, or well over $1,000,000 annually. Extraction of pyrite for the manufacture of sulphuric acid they regard as a possibility, thus adding further to income.

However, only the picking-table refuse definitely was studied. Of this, large samples were taken at twelve mines in the State. Each sample was crushed, sized and tested by float-and-sink methods in the laboratory, with results which indicate that a third of the material could be recovered profitably as marketable coal. Two plants are receiving pyrite as well as clean coal from pickings. They crush these in a rotary breaker with round holes of 2-in. diameter or smaller, through which broken coal and soft refuse pass. Hard pyrite is not broken but is recovered as an oversize product at the end of the rotary breaker. At one of these plants refuse from coal jigs is further treated in separate jigs to recover pyrite.

Much minus 48-mesh dust, produced in the preparation of special stoker coal, is wasted, but some is worked back into screenings. Some is entering the market as dust. Much coal is lost in sludge, as no attempt has been made to recover it. At some plants the sludge may be as coarse as 10-mesh. The quantity of minus 48-mesh material in minus $\frac{1}{8}$-in. screenings may be as much as 15 per cent. In a 5,000-ton plant it may easily reach 100 tons daily. Many charts and tables illustrate float-and-sink determinations of the refuse tested.

The Slagging Action of Western Pennsylvania Coals on Different Types of Refractories in a Small Pulverized-Coal Installation, by C. R. Fettke and W. E. Stewart, Carnegie Institute of Technology. Bulletin 73, 90 pp., 6x9 in.; paper. Price, $1.

This bulletin, prepared under the auspices of the Mining and Metallurgical Advisory Boards, Pittsburgh, Pa., after tests of pulverized coal in a refractory furnace, sets refractory materials in the following order, the last having the greatest resistance to slag erosion: forsterite, silica, chromite, magnesia, high-heat-duty flint fireclay, super fireclay, intermediate mullite, high alumina (diaspore type), high alumina (electrically fused alumina type), high mullite (bonded type), cast mullite and silicon carbide.

Erosion depends on composition of the coal ash. No erosion occurs until the refractory face is heated above the ash-softening temperature. The higher that temperature, the less erosion. Every combination of coal ash and refractory has a definite temperature below which, practically, the refractory will not erode. Erosion begins only when the tensions between the faces of refractories and coal ash are such that the molten ash will wet the refractory surface.

As soon as the critical temperature for a refractory is passed, slag attack increases in proportion to rise in temperature, but above 2,700 deg. F. the temperature coefficient of aluminous silicate refractories rises. Slagging, says the bulletin, is a solvent action.

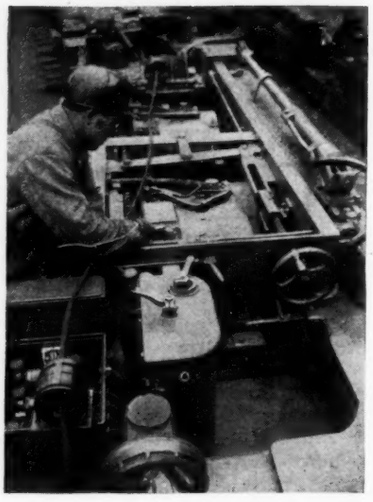
OPERATING IDEAS

From Production, Electrical and Mechanical Men

Axle Chains Add 50 Per Cent To Service Life of Tires

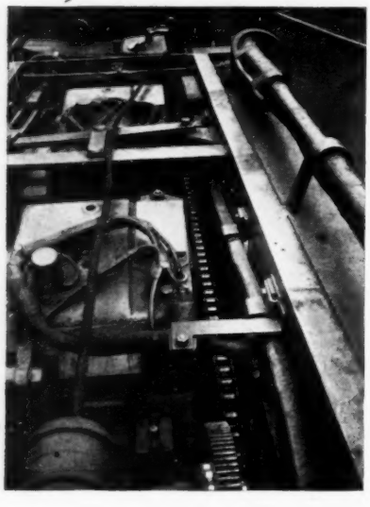
Every practical operating improvement is being incorporated into the rebuilding jobs under way on the old-style cable-reel gathering locomotives in the Powellton (W.Va.) division of the Koppers Coal Co. Opinions of local officials are that one of the major improvements—adding of a sprocket and chain between axles to eliminate slipping of one truck when motors are in series—has the important economic advantage of adding 50 per cent to the tire life formerly secured.

The illustrations show a locomotive-rebuilding job just being completed in the mine shop at the No. 3 operation, where the program was begun two years ago. This locomotive, originally a Jeffrey 6-ton unit with Type MH88 motors, was rebuilt to 8 tons, using the same motors. In rebuilding the frame, all parts, including the deck plates, were arc-welded. The drive chain installed between axles serves also as a means of providing optional slow-speed operation, which can be accomplished by continuous use of the series position.



Mine Electrician E. A. Miller is justly proud of his rebuilding jobs

The chain between axles increases tire life 50 per cent. Heat-insulated cable is used for all wiring and motors are equipped with the thermostats



Motors are fused separately and in addition are equipped with thermostats. Ground potential control is installed and instead of one contactor two are used and these are connected in series as a safety feature. To provide an emergency means of cutting off the power in the event of a ground occurring in the controller or the leads thereto while the locomotive is operating on the trailing cable, a snap switch is provided for opening the coil circuit (cable-reel side) of the transfer switch. The same protection is not required for trolley operation because then the motorman may disengage the trolley pole in an emergency.

Wheels, which on this type of locomotive are outside the frame, are protected by combination mud guards and shields. Cable with heat-resisting insulation—Rockbestos in this case—is used throughout. Details, such as protecting fuses against reduction of current capacity by reason of external heat, have not been neglected. A space directly above a main resistance pocket was the best place available for mounting the fuse and transfer switch, and, to protect them from the heat, spacing washers are placed over the mounting bolts to provide for air circulation.

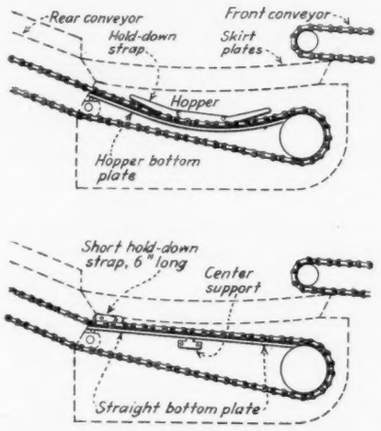
—◆—

Loader Operation Improved By Hopper Revisions

By making the changes shown in the illustrations on page 327, it has become virtually impossible to overload the hoppers on Joy 5BU loaders, writes Thomas James, Knox Consolidated Coal Corporation, Vincennes, Ind. When the loaders were installed, the skirt plates on the tops of the hoppers were 6 in. high. Spillage was so bad that it kept two men cleaning track after three machines, and consequently the rear end of the front conveyor was raised and the height of the skirt plates was increased to 9 in. This helped materially, but even with this assistance it sometimes was necessary for the operator to stop the loader when working in loose coal to give the rear conveyor time to clear the hopper. Also, large chunks frequently would straddle the hopper and have to be broken up before they would feed out. This, of course, cut down the performance of the machine.

The hopper revision consists of removing the original curved bottom plate and substituting a straight plate with a short hold-down strap 6 in. long at the rear end of the hopper, as shown in the accompanying sketch. Two holes are drilled through each side of the hopper to accommodate the center support for the new hopper-bottom plate. This may be an angle or any other convenient support. The new hold-down strap may be sawed off the original and installed by means of two bolts. Outlay consists of the cost of a new straight bottom plate and seven hours of labor.

With the new design, Mr. James declares, it is impossible to run the hopper over or even keep it full, regardless of how hard the machine is crowded into the coal. This results from the fact that when the coal lands on the straight bottom plate it is carried away immediately, instead of rolling around, as on



Above, diagramatic sketch of hopper as originally fitted with curved bottom plate; below, showing straight bottom plate and short hold-down strap in place.

the curved bottom plate. Spillage from the hopper has been eliminated, a reduction of 10 seconds in loading time per car in loose coal has been effected, and the life of the chain and side clutch have been lengthened by reducing friction.

—⟡—

Jump-Over Switch Design Raises Effectiveness

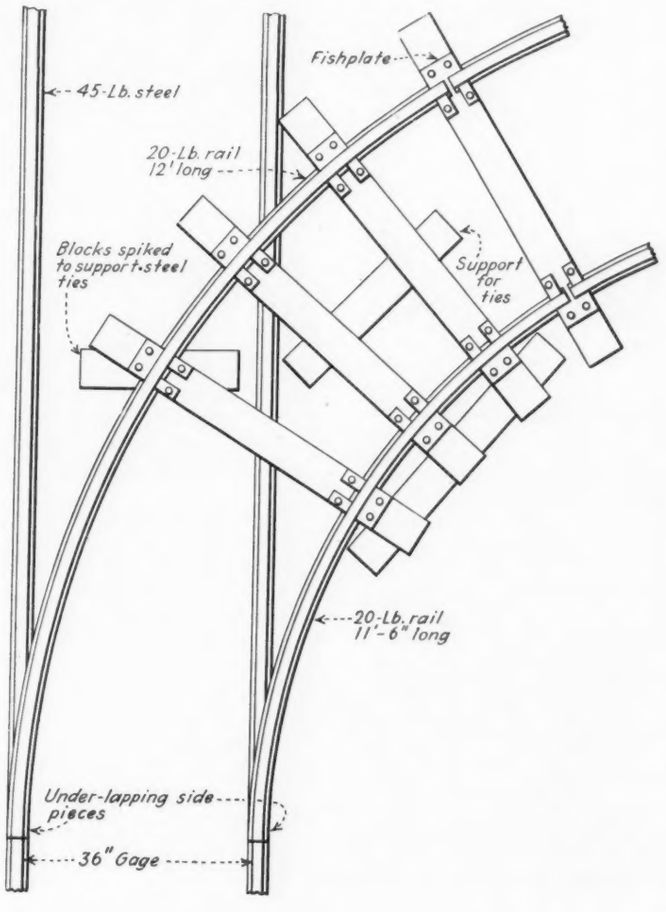
"Every mine foreman is familiar with the shortcomings of the necessary but too often ineffective temporary jump-over switch," writes Alexander H. Bennett, Springfield, Ill. "The usual procedure is to excavate and place four wooden ties and notch the spaces for the temporary curve point, then hitch on a lopped-off latch working on a swivel to slip on top of the straight rail. That this arrangement is very ineffective is commonplace, and the consequent derailments of loaded dirt cars and empty cars has resulted in more gray hairs than any other one item in the game.

"Here I have an arrangement that should be a genuine boon to every mine foreman in the country. It has the advantage of being both cheap and simple —like many another effective development. Get two lengths of 20-lb. rail, one 12 and the other 11½ ft. long. Curve them to suit. One end of each rail is worked out to a wedge-shaped flat point with underlapping sidepieces. The sidepieces fit snugly on either side of the rails of the main track. The opposite ends of the rails are fishplated to the aircourse track.

"Four steel ties hold the switch rails in place. The track into the aircourse is just the thickness of the rails higher than the main track, so that all that is necessary is to throw the assembled switch across the main track, fishplate the joints in the aircourse and swing the points around until they fit snugly over the straight rails. A few blocks are placed between the straight rails to support the steel ties. When not in use, it is a simple matter to disconnect the fishplated joints and pick up the entire switch, throw it on a car and transfer it to wherever a like switch is needed. Or it can simply be tipped up on the side until the job is over. The switch can be dismantled readily by knocking loose the steel ties before moving, if desired. The same arrangement turned around makes a left-hand switch.

"Not only is this jump-over switch a money and goat saver in aircourse work but it also can be used to advantage in all development-entry work. Usually every crosscut has a switch for about five cuts of coal, which then is picked up. Every fourth crosscut switch is left for a permanent pulling cut-off. Where it is possible to dig the fireclay it is not uncommon for a tracklayer to spend the entire day laying and recovering a temporary crosscut switch. With this jump-over switch in use on every development entry, one can readily see the economies which can be effected when three out of four crosscuts can be cleaned up by this simple expedient of the jump-over."

Details of the jump-over switch and how it is installed



★ ★

Mutual

• The operating, electrical, mechanical or safety man who follows these pages closely from month to month should be able to avoid much wasted effort in discharging his duties. The problem he may be facing in many cases has been encountered by his neighbor or some man in a distant field. This department is organized to present the solution. However, as a man does not want to take all and give nothing, those who borrow from these pages likewise will want to contribute to them. So let us have the time- and money-saving short cuts which you have evolved to help you in your daily work. Each acceptable one will be paid for at the rate of $5 or more. If it will help to make it clearer, a sketch or photograph should accompany each item submitted.

Hints From a Shopman's Notebook; Machining Joy Pedestals

BY WALTER BAUM
Master Mechanic, Perry Coal Co.
O'Fallon, Ill.

PEDESTALS on early Joy 5BU loaders were made without bushings in the holes to take care of wear, and the jig described below was developed for boring a pair of pedestals (Nos. 1508 and 1509) with badly worn hinge-pin holes preparatory to the installation of bushings. Due to the shape and size of the castings and to the fact that only lathes were available for boring, it was necessary to design a jig that would hold both pedestals and permit boring the holes in one set-up so that they would line up with each other when the pedestals were placed back on the loader. Also, as additional pedestals were to be bored, the jig was designed so that it could be put back on the lathe without having to do anything but line it up with the lathe centers.

The machined surfaces around the bearings offered the only opportunity of holding the pedestals so that the holes would be true with each other. These machined surfaces had six holes around a 6½-in. diameter which were threaded for ½-in. capscrews. The outer bearing race was left in the pedestals. The machined recess back of the bearing race for the oil seal offered the next point

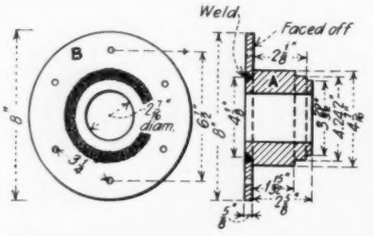


Fig. 1—Shaft and plate assembly

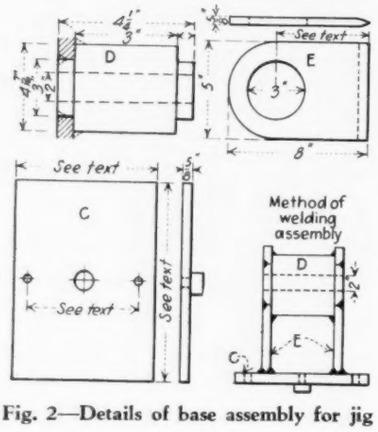


Fig. 2—Details of base assembly for jig

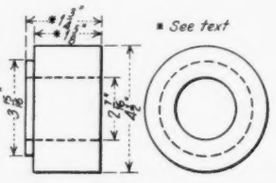
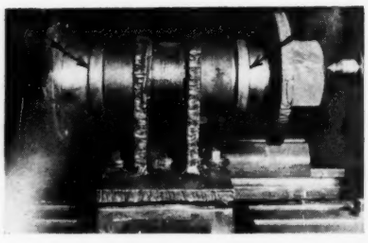


Fig. 3—Details of spacer collar

of bearing to hold the pedestals, as it was smaller (4.2420 in. in diameter on the first pair of pedestals) than the inside of the race. On the next pair (1508C and 1509C), however, the diameter was 4.7560 in., and consequently the collar shown in Fig. 5 was made to take care of the two diameters.

In making the jig, two pieces of 4 7/16-in. shaft were cut 3¼ in. long and were bored with 2-in. holes in the centers. Next, they were put on a mandrel and one end was turned down to 4⅛ in. ⅝-in. back and beveled for welding. Then two round plates 8 in. in diameter (*B*, Fig. 1) were cut out of ⅝-in. steel with 4⅛-in.-diameter holes in the centers beveled for welding. Plates and shafts then were assembled by welding as in Fig. 1, and after cooling were chucked as true as possible in a lathe and the 2-in. holes bored out to 2 7/16 in. Then, using a mandrel with Plates *B* toward



View of jig bolted to cross carriage. Arrows indicate collars providing for variation in sizes of oil-seal recesses.

the faceplate, the assemblies were machined as in Fig. 1. At the same time the holes were laid out and drilled. When completed, an assembly should fit the machined places on a pedestal snugly.

As a start in the construction of the base assembly for the jig (Fig. 2), another piece of 4 7/16-in. shaft 4¼ in. long was cut and a 2-in. hole bored in the center. Using a mandrel, the ends were machined as in Fig. 2 and beveled for welding. Now the compound on the lathe to be used was removed, and Plate *C* was cut from ⅝-in. steel, the measurements of this plate and the location of the holes being obtained from the compound base. The pivot hole in Plate *C* will depend on the kind and size of lathe used. Next, two plates, *E-E*, were cut from ⅝-in. steel with 3-in. holes as indicated in Fig. 2. The distance from the center of the hole to the straight end of the plate is obtained by measuring from the top of the cross carriage, where the compound bolts, to the point of the tailstock center on the lathe used. The holes in the plates are beveled for welding. Plates *C* and *E* and Shaft *D*

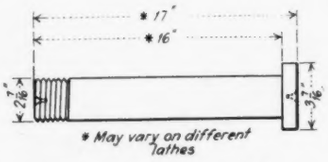
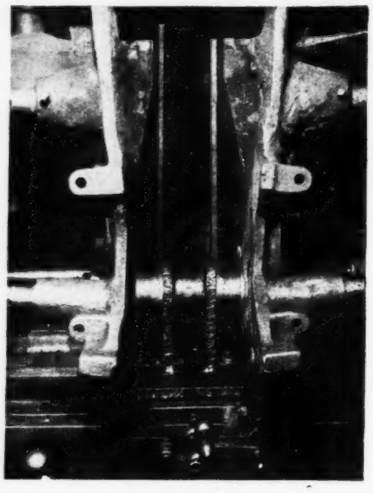
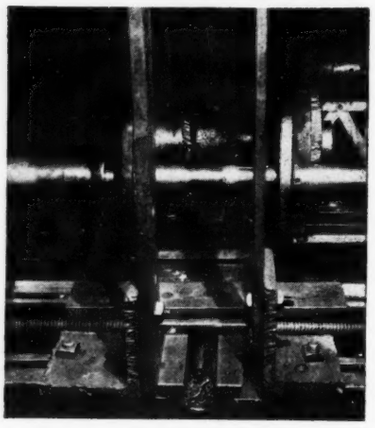


Fig. 4—Details of bolt



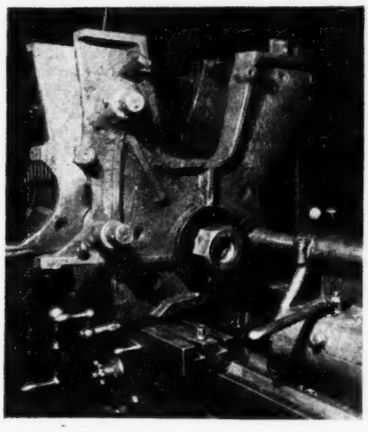
View of pedestals from front of lathe, showing jig.



View of pedestals from back of lathe, showing how they were braced.

are assembled by welding as indicated in Fig. 2, after which the assembly is chucked in the lathe, and Plate *C* is faced off on the bottom side and bored with the pivot hole.

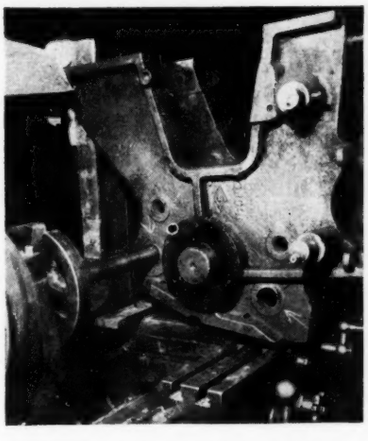
Spacer collars (Fig. 3) were next made just long enough so that the straight side is in line with the sides of the cross carriage on the lathe used after the base assembly is bolted in place. Diameter of the holes in the collars is $2\frac{7}{8}$ in., and the shoulders fit the ends of Shaft *D* after facing off. Next a bolt with nut to match was made as in Fig. 4. Length of this bolt depends on the width of the base of the compound on the lathe used.



View from tailstock end of lathe, showing large nut used to clamp the two pedestals to the jig. In the back a brace can be seen.

With the bolt completed, the base assembly (Fig. 2) was bolted on the cross carriage in the place of the compound and the 2-in. hole was bored out to $2\frac{7}{8}$ in. and the ends of the shaft were faced off. This left the assembly in line with the lathe centers. The cross carriage then was run back and the

View of pedestals from spindle end of lathe with boring ready to start.



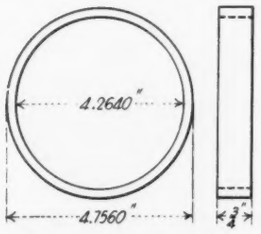


Fig. 5—Details of collar taking care of two different sizes of holes for the oil seals

pedestals were lifted with a chain hoist and bolted in place with the back ends braced as shown in an accompanying halftone. The hinge-pin holes then were bored out to $2\frac{1}{4}$ in., which is the outside diameter of factory bushing No. 5151 used on the later 5BU machines. Three pairs of pedestals were bored out with this jig, and the holes were in perfect alignment when they were replaced on the loaders.

Low-Friction Bander Made From Locomotive Parts

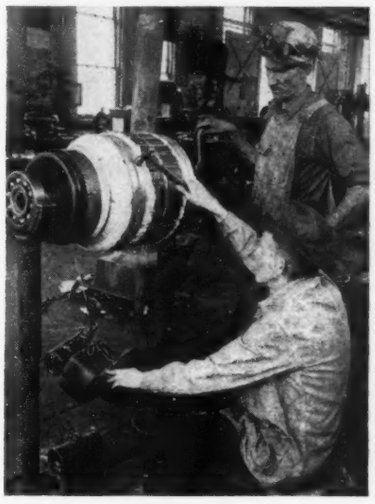
Adaptability, easy turning and safety are features of the armature banding stand used in the Jenkins repair shop, which serves the Kentucky division of the Consolidation Coal Co. The accompanying halftone is from a recent photograph made during the process of banding a locomotive armature.

The flanged bases of the pedestals rest in a recessed groove in a stationary floor plate and thus their spread is quickly adjustable to accommodate an armature of any shaft length. Handwheels lock the pedestals in place, thus guarding against spreading, which might cause dropping of the armature. Contrary to an impression that might be gained from the illustration alone, pedestal height is not adjustable. The extra-long screws were used only because they were available from a stock of miscellaneous parts.

One-half of a frame head from a mine locomotive serves as the top yoke of each pedestal and the mounting is by arc-welding. Resting in these frame-head halves are two ball bearings, one size No. 414 and one No. 418, which accommodate the shafts of the largest armature. Special sleeves which slip into these ball bearings serve as adapters for armatures having shafts of smaller diameters.

Banding is done by the pulley-and-weight method, and to hold friction to a minimum the sleeve of the pulley to which the weights are attached is fitted with a ball bearing. This feature, together with the ball-bearing journals, means that the cranking can be done without appreciable effort.

Banding by the pulley-and-weight method was originated in the early days



Anti-friction mounting facilitates an excellent job with slight effort

of armature winding but because it was slow it was displaced to a great extent by tension methods wherein the wire is wound to permanent position in the first application. For bringing the coils gently down to a compact group and finishing with bands of uniform tension it is doubtful if any system can equal the pulley-and-weight method.

Bag Delivery of Tamping Clay Has Triple Advantages

Usually the operating advantages of a new mining practice adopted to promote safety or a higher over-all labor efficiency has as a partial offset an increased cost for equipment or supplies. The reverse, however, proved true with the bag delivery of tamping material started a few months ago at No. 3 mine of the Koppers Coal Co., Powellton, W. Va. Cost of the bags was more than offset by a consequent reduction in the quantity of clay to be handled.

Paper bags costing 5c. each were tried first, but proved to have an unforeseen disadvantage in that rats ate the glue from the seams, destroying the bags and spilling the material. Now, the practice is to use reconditioned cement sacks of woven fabric costing approximately 7½c. each. These are used over and over except that a few are appropriated by the miners.

Bags are filled at a clay bank on company property 5 miles from the mine and are hauled by motor truck to the foot of the mine-supply incline, where they are loaded into mine cars. A bagful of the material tips the scale at approximately 60 lb., which is a convenient weight for handling. The miner makes his own dummies in his working place, as is the practice in the field.

WORD FROM THE FIELD

Coal Industry Is Divided On Wages-Hours Bill

Hearings on the Black-Connery Labor Standards bill, covering wages and hours, held by joint session of the Senate Education and Labor Committee and the House Labor Committee, consumed a large part of the first three weeks in June. A poll of the Senate indicates a favorable attitude toward enactment of wage and hour legislation at this session, though there is a strong likelihood that the measure will be sharply revised. According to Robert Jackson, Assistant Attorney General, the purpose of the bill "is not to affect collective bargaining but to reach those who do not receive the benefits of collective bargaining."

John L. Lewis, president, United Mine Workers, spoke in support of the bill on June 7, though urging elimination of Sec. 5, which provides that whenever the proposed Labor Standards Board has reason to doubt the facilities for effective bargaining, it shall conduct an investigation and, with its findings as a basis, issue an order setting hours and wages not to exceed $1,200 per year. He recommended a minimum wage of 40c. per hour; five workdays of seven hours each per week, the Board to have authority to vary hours between 30 and 40, making the minimum wage $14 to $16 a week.

In behalf of the National Coal Association, John D. Battle, executive secretary, urged on June 14 that the bill be amended to exempt the bituminous coal industry from its provisions. As reasons for this stand he called attention to the two-year contract recently signed with the United Mine Workers carrying a 35-hour week and material increases in pay and enactment of the coal control act. Even if constitutional, he added, the bill would be undesirable because: (1) It sets up no standards for determination of fair wages and a reasonable work week; (2) it confers upon the Labor Standards Board revolutionary powers over labor relations; (3) higher wages would result in higher costs, higher prices, decreased demand and increased unemployment; (4) it would lessen the operating time of capital equipment and reduce production, except for the increase that would result from "speeding up" machinery; (5) it will do nothing to alter the terms of distribution of products as between capital and labor; (6) its final effect will be not to add to but to detract from the economic well-being of society.

The American Mining Congress also protested against enactment of the measure.

Coal Parley for Geneva

The governing body of the International Labor Organization at Geneva, Switzerland, announced on June 1 that a tripartite conference on coal mining would be held there next April to consider all aspects of the industry directly or indirectly affecting social conditions. Overseas as well as European countries will take part, American participation being especially sought.

Keeping Step With Coal Demand

Bituminous Production

	1937 (1,000 Tons)	1936* (1,000 Tons)
May 1	6,757	6,864
May 8	6,980	6,840
May 15	7,220	6,744
May 22	7,336	6,819
May 29	7,517	6,678
June 5	6,600	6,430
June 12	6,995	6,697
Total to June 12	203,512	181,297
Month of April	**26,010**	**30,452**
Month of May	**29,980**	**28,684**

Anthracite Production

May 1	1,439	1,536
May 8	915	1,335
May 15	1,017	1,108
May 22	1,046	989
May 29	1,145	1,330
June 5	959	866
June 12	1,069	911
Total to June 12	25,376	27,040
Month of April	**6,736**	**4,773**
Month of May	**4,204**	**5,121**

* Outputs of these two columns are for the weeks corresponding to those in 1937, although those weeks do not necessarily end on the same dates.

Bituminous Coal Stocks

	(Thousands of Net Tons) May 1 1937	April 1 1937	May 1 1936
Electric power utilities	8,504	8,717	5,613
Byproduct ovens	8,544	9,638	3,515
Steel and rolling mills	1,748	1,898	807
Railroads (Class 1)	8,169	11,056	4,674
Other industrials*	12,806	13,844	6,837
Total	39,771	45,153	21,446

Bituminous Coal Consumption

	(Thousands of Net Tons) May 1 1937	April 1 1937	May 1 1936
Electric power utilities	3,294	3,590	2,711
Byproduct ovens	6,247	6,453	4,993
Steel and rolling mills	1,226	1,374	1,157
Railroads (Class 1)	7,453	8,404	6,841
Other industrials*	12,213	13,472	9,515
Total	30,433	33,293	25,217

* Includes beehive ovens, coal-gas retorts and cement mills.

Earle May Ask Federal Aid To End Bootlegging

Governor George H. Earle, of Pennsylvania, announced on June 4 at Harrisburg, Pa., that he might ask the federal government to intervene if he failed to get an agreement with anthracite operators to reopen idle collieries in Northumberland and Schuylkill counties to curb "bootleg" mining. The Keystone executive said he would ask the producers to reopen a group of collieries by Jan. 1, after more than a thousand self-hired workers went to the State Capitol asking that something be done to aid them. Following a visit to the bootleg mining area in December, Governor Earle told the workers in the makeshift operations that he would exert every effort to persuade the operators to reopen idle collieries, reduce the price of anthacite, and promote better merchandising. Senators James J. Davis and Joseph F. Guffey expressed opposition to the Governor's proposal to seek federal control unless the anthracite producers set their house in order.

Officials of the United Mine Workers and Representative Patrick J. Boland, of Scranton, pressed forward on June 10 with plans for an anthracite regulation act similar to the Guffey Act. After conferring with Senator Guffey and Representative Boland, Thomas Kennedy, Lieutenant Governor as well as secretary-treasurer of the union, said he was working with the union's lawyers on several points. Senator Guffey was reported as saying that he would have no part in such a move at present, but Representative Boland said he was anxious to "get a bill in this session."

Two bills requiring a certificate of origin with all coal trucked into New Jersey and the registration of dealers were signed on June 4 by Governor Harold G. Hoffman. In affixing his signature he said he heartily approved the measures as needed to halt the traffic in stolen goods. Measures outlawing the illicit coal traffic have been passed also by the legislatures of New York and Maryland, and an ordinance directed against it is pending in New York City. The Anthracite Institute has been urging passage of the last-named ordinance ever since its introduction in the Board of Aldermen.

New Preparation Facilities

CARBON FUEL CO., No. 3 mine, South Carbon, W. Va.: Contract closed with Robins Conveying Belt Co. for new four-track tipple, equipment including 2x600-ft. sectional mine conveyor,

5x10-ft. double-deck Gyrex screen, two vibrative double-branch transfer chutes with rescreening sections, 42-in. picking and boom conveyors for lump, 36-in. picking and boom conveyors for egg and stove, 30-in. scraper conveyor, 4x10-ft. double-deck Vibrex screen, 20-in. belt conveyor for nut coal, scraper conveyor for picking-table refuse chutes. Capacity, 200 tons per hour.

CRYSTAL BLOCK COAL & COKE CO., Buchanan County, Virginia: Contract closed with Jeffrey Manufacturing Co. for five-track tipple with full screening, crushing, mixing and loading facilities for six sizes, including Jeffrey-Traylor vibrating screens for stoker coal; a rope and button conveyor about 1,000 ft. long will retard coal down the mountainside from the headhouse, where a mine-run bin will be installed for drop-bottom cars.

F. H. DOWNEY, INC., Harrisburg, Pa.: Contract closed with Deister Concentrator Co. for No. 7 Deister-Overstrom Diagonal-Deck table to treat No. 3 buckwheat at rate of 10 tons per hour.

HUME-SINCLAIR COAL CO., Hume, Mo.: Contract closed with McNally-Pittsburg Manufacturing Corporation for McNally-Norton automatic washer to clean 7x0-in. coal; capacity, 250 tons per hour; addition to existing plant.

KNOX CONSOLIDATED COAL CORPORATION, No. 2 mine, Bicknell, Ind.: Contract closed with Morrow Manufacturing Co. for Prins multi-flow washer together with conveyors and dewatering screens; capacity, 110 tons of 1¼x3-in. coal per hour; probable date of completion, Aug. 1.

MOFFAT COAL CO., Taylor Colliery, Taylor, Pa.: Contract closed with Finch Manufacturing Co. for two 12-ft. Menzies cone separators, one unit to clean stove and the other to clean chestnut coal, each with a feed capacity of 160 tons per hour.

NEW YORK COAL CO., mine at Chauncey, Ohio: Contract closed with Morrow Manufacturing Co. for Prins multi-flow washer together with elevators and conveyors for handling coal and refuse; capacity, 25 tons of 1¼x3-in. coal per hour; probable date of completion, July 15.

NORTHWESTERN IMPROVEMENT CO., Roslyn, Wash.: Contract closed with Deister Concentrator Co. for No. 7 Deister-Overstrom Diagonal-Deck table to treat ¼x0-in. coal at rate of 10 tons per hour.

New Anthracite Code Dies

The revised anthracite code written by Michael J. Hartneady, Secretary of Mines of Pennsylvania—*Coal Age*, June, p. 290—was lost in the last-minute rush of the General Assembly session on June 6. The code died in a conference committee. Its death was due largely to the opposition of United Mine Workers members, who contended that the old code had "stood the test of time and the courts." Mr. Hartneady formerly was president of District 7, U.M.W.

Varied Program Marks Summer Meet Of Indiana Coal-Mining Men

EVANSVILLE, on the crescent of the now-peaceful Ohio, was again host to the members and guests of the Indiana Coal Mining Institute on the occasion of the 1937 summer meeting, held June 5 at the Vendome Hotel. At the technical session, those in attendance were treated to discussions of the principles and advantages of time-study work, with examples from experience at the Kings mine; geology in relation to coal, oil and natural-gas formation; and the construction and use of the flame-safety lamp. The gavel was wielded by H. P. Smith, Terre Haute, general manager, Princeton Mining Co., and institute president, assisted by Secretary Harvey Cartwright, commissioner, Indiana Coal Operators' Association, Terre Haute.

In a resolution proposed by B. E. Schonthal, Chicago, secretary of the Illinois Mining Institute, the Indiana group protested against the action of the House Appropriations Committee in cutting the funds proposed to be allotted to the Safety and Explosive sections of the U. S. Bureau of Mines for work in the fiscal year 1937-38 from $28,155 to $5,635, and asked that the appropriation be restored to the original total by the Senate Appropriations Committee.

Budgetary Control Necessary

"After the industrial revolution," declared P. R. Paulick, Princeton Mining Co., Princeton, Ind., in analyzing time studies in relation to mechanized mining, "industries grew steadily in size and complexity until the destiny of an enterprise could be governed no longer by one individual and the management control changed from a personal to a statistical basis. Thus, forecasts and budgetary control now are based upon facts and figures rather than upon intuition and personal experience." Establishment of a definite goal has been shown to be the most effective way of obtaining results, and here time studies, making possible the determination of accurate standard production capacities for men and machines, show their best results. Time studies are employed also to analyze and correct faulty or inefficient operating practices, determine the best way of doing a job, eliminate delays, etc. Standard production capacities derived from time studies also may be used as a yardstick against which actual results may be measured and an efficiency rating given each operating unit.

High unit cost per ton can be traced to three principal sources—all susceptible to time-study analysis and correction: (1) losses from failure to use mine area effectively—lack of concentration—and failure to use equipment and labor to its full capacity; (2) losses due to unnecessary delays, waits and interruptions; insufficient labor, tools, supplies, etc.; lack of proper equipment and a poorly planned mining system; and (3) losses resulting from excessive and unbalanced supply inventories—repair parts, timbers, ties, rails, etc.

The equipment required for time-study work is simple, including a good stop watch, time-study forms, observation board, pencils and a slide rule. Making a time study, however, "does not mean merely recording the elapsed time during the performance of the job. In the fullest sense, time study means breaking down a job into its elemental operations and subjecting each elemental operation to close scrutiny and analysis" for the following purposes: elimination of all unnecessary movements, delays and waits, and standardization of all motions, methods and conditions so that finally the entire operation can be standardized and a standard time for its performance set.

Three Elements of Time Study

"Actual time-study procedure comprises three separate operations": (1) a preliminary survey during which the time-study engineer, without watch or other equipment, analyzes the job to familiarize himself with the general situation and eliminate large and outstanding faults—using the scoop shovel, as it were; (2) the actual observation period, in which the job is broken down into its elemental operations, each of which is studied with the stop watch and the elapsed time recorded on the time-study form, along with delays, waits and interruptions, supplemented by data on operating conditions and a sketch of the work; and (3) summarization of the time study and computation of standard capacities at the office. After the study has been summarized and the productive time separated from the non-productive, the former is separated into its several elemental parts, corresponding to the various operations, which are called unit standard times. With these unit times available, setting up a standard time allowance for a job becomes merely a matter of addition, and when a flat percentage allowance for personal needs and unavoidable delays is included the finished product is the standard time for the job.

A sample time study made about two years ago at Kings mine of the Princeton Mining Co. is shown in Table I. Table II shows the derivation from a number of individual time studies of the standard productive capacity for 10BU and 11BU Joy loading machines at the mine. Using the same procedure, standard productive rates for cutting machines, drills, locomotives, hoist, tipple, etc., have been determined.

Once this tool for measuring the productive capacities of all production and service units is available, it may be used in several ways for controlling cost and increasing production. One is the chart system, which has the advantage that

all information is on a single sheet of paper so that the performance of each unit, in comparison with standard performance, may be determined at a glance, particularly in the case of units falling below the standard. Similar charts may be prepared for groups of machines or the mine as a whole, using ordinary cross-section paper and plotting tonnage vertically and time horizontally. In addition to tonnage, the name of the boss is shown, along with the location of the machine and the standard productive capacity. At regular intervals—monthly—the average tonnage and the efficiency of the unit are computed, giving a complete record of performance.

Time studies are the keynote of efficiency in mechanical mining, declared F. M. Schull, general superintendent, Binkley Mining Co., Terre Haute, who presided over the discussion. Joseph Anstead, electrical engineer, Templeton Coal Co., Sullivan, Ind., pointed to two general purposes of time-study work: compilation of general material for managers interested in a broad over-all picture and the collection of specific performance data for men actually in charge of mining operations. One of the major advantages is balancing the work of the various types of equipment in each section so that maximum output is obtained from all. Time studies also bring out the effect of bad track and other adverse physical conditions; the efficiency of the maintenance and service organizations, as reflected in equipment condition and operating time; and the degree of equipment obsolescence and the benefits which may be expected from its replacement. Time studies do not mean anything unless the resultant revisions are still valid after the time-study engineer has gone on, contended J. S. Anderson, general superintendent, Saxton Coal Mining Co., Terre Haute. Consequently, proper cooperation is required from all men involved, and particular attention must be given to whether or not men are working at a normal or greater-than normal rate while the study is being made.

Formation and distribution of coal and the relation of coal, oil and natural-gas fields was the subject of a lecture by Dr. R. W. Karpinski, assistant professor of geology, Indiana State Teachers' College, Terre Haute, who then directed his attention to possible outlets for coal in the production of motor fuel, electric power from mine-mouth generating plants and in the production of chemicals and dyes. Motor-fuel production from coal offers great future possibilities in the United States, and probably will prove more practicable than distillation of oil shales. Basing his conclusions on recent drilling results in Illinois, Dr. Karpinski also forcast oil-exploration operations in southwestern Indiana in the near future.

Prefacing his remarks with a brief history of its origin and development, Howden Riggs, Saxton Coal Mining Co., Terre Haute, discussed the use and misuse of the flame safety lamp. "The modern flame safety lamp," Mr. Riggs asserted, "is the most convenient instrument yet devised for the rapid determination of explosive gas (methane, or CH_4), and is the device generally used in mines because of its simplicity, low cost and dependability in the hands of careful and experienced men."

Dangerous practices in the assembly or use of a flame safety lamp include: omission or improper installation of the gasket; misplacement or omission of the expansion ring; omission of a gauze or use of a gauze which has been mashed, crammed together or punctured or has a broken wire; removal of the bonnet; dirty gauzes; air-admission ring improperly seated, punctured or with broken wires; omission of the igniter; failure to hold the lamp in a vertical position while making a test; failure to lock the lamp securely before giving it out; and use of the lamp as a sounding instrument in testing roof.

While flame safety lamps with key locks originally were granted approvals, disasters occurring because lamps were opened to relight them in the mine led to a revision of this practice, remarked C. A. Herbert, supervising engineer, Vincennes (Ind.) station, U. S. Bureau of Mines. In general, lamps were opened because the igniter failed to work, and this most often is due to the fact that the igniter is not kept in proper condition or the wrong kind of fuel is used. The two major flame safety lamps of today are essentially the Clanny bonneted lamp with modern improvements, and there is no record of a modern lamp causing a gas ignition or explosion when properly assembled or handled.

When methane is present, a flame safety lamp will continue to burn even when the oxygen content of the air is reduced to around 13 per cent. Also, under certain conditions of methane and oxygen combination, no change can be determined in normal flame length when methane is present, although the flame will turn reddish and apparently leave the wick as the oxygen content is reduced. The line of extinction of flame in methane-air combinations also may be used as a guide as to whether or not an explosion may be expected in reopening and ventilating sealed areas.

Table I—Summary of Loading-Machine Time Study, Kings Mine

Machine studied	No. 12 Joy (10BU)
Type of work	26-ft. wide rooms
Study number	K–66
Date of study	Feb. 20, 1935
Rating	Fast
Location	1 South S.W.M.S.

Working Time:	Time in Minutes	Per Cent of Total	Number of Units	Time per Unit in Minutes
Tramming machine	37.7	9.0	7 places	5.39
Loading coal	159.1	37.8	121 cars	1.32
Changing cars	123.3	29.4	121 cars	1.02
Getting empties	25.5	6.1	121 cars	0.21
Total working time	345.6	82.3	.....	....
Delay Time:				
Waiting for empties	36.1	8.6	.....	....
Derailments	1.8	0.4	.....	....
Conflict with other work	17.0	4.0	.....	....
Mechanical trouble	7.5	1.8	.....	....
Extending track	2.0	0.5	.....	....
No power	2.0	0.5	.....	....
Miscellaneous delays	8.0	1.9	.....	....
Total delay time	74.7	17.7	.....	....
Grand total time	420.0	100.00	.....	....

Production data:	
Total cuts loaded	7
Total cars loaded	121
Total tons loaded	424
Average cars per cut	17.3
Average tons per cut	60.4
Average tons per car	3.5
Average dimensions of cut	26 ft. W.; 7.1 ft. D.; 7.8 ft. H.
Average car-change distance	120 ft.

Table II—Standard Tonnage Capacity Computation, 10BU and 11BU Joys, Room Work, Kings Mine

	Unit Time	Units per Cut	Minutes per Cut
Tramming machine	4.90	1 cut	4.90
Loading coal	1.38	18 cars	24.84
Changing cars	1.07	18 cars	19.26
Getting empties	0.20	18 cars	3.60
Total	....	.....	52.60
Allowance for unavoidable delays (10 per cent)			5.26
Total standard time per cut			57.86
Cuts per seven hours			7.3
Cars per seven hours			131
Tons per seven hours			458

Mine Sit-Down Strike Ends

Full operation was resumed on June 3 in the Superior Coal Co.'s No. 4 mine, Wilsonville, Ill., after six members of a strike committee which had directed a stay-in demonstration were

discharged for "interference with the operation of the mine." More than 350 miners had occupied the workings for nearly 200 hours in an effort to force compliance with demands for division of work with unemployed fellow miners.

Fred S. Pfahler, president of the company, announced the discharges. John Fisher, president of Gillespie local, Progressive Miners, however, said the struggle "will continue until our demands are met." The cases of the six discharged miners, as well as those of three others, who were discharged for disobedience before the stay-in demonstration began, have been referred to the executive committee of the union for negotiation under procedure provided for in its contract with the company.

Uniform Temperatures Easy With Coal-Fired Plants

That uniform temperatures which are universally indorsed by medical authorities for maximum comfort and health can be maintained in the home with even the simplest type of hand-fired heating plant has been demonstrated in a recent program of research on residential heating which was carried on by Bituminous Coal Research, Inc. The average householder controls the dampers and intervals of firing his furnace by his own reactions: he turns the furnace on when he gets too cold and turns it off when he gets too hot. The use of his own body as a thermostat generally results in wide temperature fluctuations which bring about discomfort and are conducive to colds. A temperature record obtained during this research which is typical showed that between 1 and 11 p.m. the temperature in the living room was 74 to 84 deg. F., a spread of 10 deg.

With simple and relatively inexpensive thermostats which open and close the dampers according to the temperature in the room, coupled with a limiting thermostat on the furnace or boiler to prevent overheating, very good control of the temperature may be obtained. In another home included in the investigation, in which thermostatic controls were included, a typical day's temperature record showed a maximum variation of 2 deg., as compared to 10 deg. for the house without the controls.

The best temperature control is obtained, of course, with coal when automatic firing with residential stokers is used. The temperature can readily be controlled within 1 or 2 deg., and, in addition to the uniformity of temperature and the comfort of a warm house on arising in the morning, the frequent trips to the basement for attention to the fire are eliminated. Where this desirable condition cannot, for some reason, be made use of, thermostatic controls for hand-firing, which are available from several manufacturers at low cost, are decidedly worth while.

Broad Range of Discussion Features Illinois Institute Boat Meeting

WITH ILLINOIS coal in her fireboxes, the Str. "Golden Eagle" moved out on the swollen Mississippi at St. Louis, Mo., the night of June 11, bearing 111 members and guests on the 19th annual boat trip of the Illinois Mining Institute. At the summer meeting next day, after a welcome had been extended to all by W. J. Jenkins, St. Louis, president of both the institute and the Consolidated Coal Co., those in attendance discussed selling accident prevention to management, electric-arc and oxyacetylene welding, recent developments in coal cleaning, and coal selection from the consumer's viewpoint. Ringmasters were R. L. Adams, general superintendent, Old Ben Coal Corporation, West Frankfort, Ill., and H. H. Taylor, Jr., vice-president, Franklin County Coal Corporation, Chicago.

Joining the ranks of the organizations which have taken similar steps, the institute adopted a resolution opposing the proposed cut in the appropriations of the Safety and Explosive divisions of the U. S. Bureau of Mines of from $28,135 to $5,635 made in the House and asking its restoration by the Senate Appropriations Committee. A further resolution for the appointment of a committee to enlist the support of the two Illinois labor organizations in the campaign also was unanimously adopted. Committeemen are: J. E. Jones, safety director, Old Ben Coal Corporation, West Frankfort; T. J. Thomas, president, Valier Coal Co., Chicago; and F. S. Pfahler, president, Superior Coal Co., Chicago.

"Before a successful safety program can become a reality, management must first be thoroughly sold on the idea," declared H. G. Westerland, director of compensation, Chicago, Wilmington & Franklin Coal Co., West Frankfort, in opening the technical sessions. "Since safety is solely a question of organization, education and supervision, it is imperative that the entire supervisory personnel, through conference meetings, inaugurate a definite procedure for the prevention of accidents. With this accomplished, management in turn can sell the idea to its workers.

"Safety must originate at the top, much the same as a work program. It is not to be expected that the worker should be more safety minded than the boss who gives him instructions for work to be performed, and by the same token the worker looks to his boss for proper instructions in the prevention of accidents.

"Before management can be expected to organize and promote a successful safety program there must first be a complete understanding of just what the causes of accidents and the effects are, and what part accidents play in determining the final cost in each department per ton produced." Indirect injury expense should not be omitted from the picture. Cooperation between management and workers is essential, and management must possess a knowledge of salesmanship as applied to putting over the idea of workers thinking and acting safely. Persuasion and understanding, rather than force without worker cooperation, yield best results.

Supervisors Attend Classes

"With this form of organization in view," C. W. & F. inaugurated a course in injury-prevention with the cooperation of the U. S. Bureau of Mines, in which the entire supervisory force participated once a week for 34 weeks. Then, with the safety idea well on its way toward supervisory acceptance, first-aid training was started with the cooperation of the Bureau and the Illinois Department of Mines and Minerals. All men now hold State and federal certificates, and in the course of the training became much more safety conscious.

"Statistics play an important part in accident-prevention work," and charts and graphs are one of the best ways of presenting them so that their effect on production and cost can be seen most easily. C. W. & F. statistics showed that losses from head and foot injuries were a large percentage of compensation costs. Safety shoes and hats were adopted and "the material reduction in accidents of this nature has proved from a practical standpoint the advantages and benefits of selling safety to the management." Similarly, a campaign for the use of safety goggles was born.

Occupational diseases are "a new hazard that will require further salesmanship." Dust-disease cost possibilities must not be dismissed lightly, for the man who "thinks that because he has not yet been called upon to defend himself against a dust claim, or that he never will be, is filling his mind with a false sense of security."

In the course of the discussion, which was started off by Alex U. Miller, as-

Rate Cut if Tipple Is Built

The Public Service Commission of West Virginia ordered the Virginian Ry. on June 12 to cut to 45c. instead of 88c. per ton the rate on coal hauled between Summerlee and West Deepwater, in Fayette County, West Virginia, if coal companies in that area erect a tipple on the Kanawha River from which river transportation may be provided. The New River Co. and the White Oak Fuel Co. asked a reduction, declaring it would afford them an outlet for greater quantities of coal for use in the Kanawha Valley industrial fields. Prior to the action of the Commission, interested coal companies were understood to be considering the erection of a 13- to 15-mile aerial tram between the mines and the river.

sociate mining engineer, U. S. Bureau of Mines, Vincennes, Ind., J. A. Jefferis, Illinois Terminal Railway System, made the point that the increase in small mines, with their higher fatality rate—double per 1,000 men employed—might eventually affect safety progress. Norman Prudent, general superintendent, Crescent Mining Co., Peoria, Ill., stressed the fact that management must first be convinced and then have the necessary knowledge to train men if safety is to be achieved. Mr. Prudent also described the system employed at Crescent No. 1 mine to make sure that the men, 100 per cent equipped for eight months, always have their safety goggles with them. Life checks are riveted to the goggles cases, which then are issued and returned the same as the usual life checks. Since adoption of goggles at No. 1, the eye-injury frequency rate has been reduced 25 per cent and the severity rate 40 per cent.

Safety education must be directed to different purposes in the cases of management and men, said J. S. Anderson, superintendent, Saxton Coal Mining Co., Terre Haute, Ind. Management is interested primarily in the dollars-and-cents aspect, and supervisors should be trained in methods of safeguarding men at the face and in ways of demonstrating such safeguards to the men they are designed to protect. If properly done, results also can be expected on the production side because men will become more efficient and take a greater interest in their work. Employees, however, are not interested in savings to the company, and instead must be shown how safeguards must be used and how the men themselves will be benefited as a result.

Management Backing Essential

All organizations have passed through that phase when the opinion was that nothing could be done about coal-mine hazards, remarked E. L. Berger, general superintendent, Bell & Zoller Coal & Mining Co., Zeigler, Ill. The duty of notifying the family in case of a serious injury or fatality goes far toward selling a manager the safety idea. Management must back up words with deeds in convincing employees that it is behind the safety idea, said James Powell, superintendent, Superior Coal Co., Gillespie, Ill. As mechanization develops, it will materially reduce injuries, he declared. A safety program based on U. S. Bureau of Mines recommendations was started at the Valier (Ill.) mine of the Valier Coal Co. about seven years ago, declared Mr. Thomas. Over this period, as compared with the preceding seven-year period, the number of injuries was reduced slightly over 80 per cent.

The old type of welding, comprising the union of heated metal under a hammer or by pressure, has been largely superseded by "fusion" welding, in which the metal is melted and flows together, said Carl Lee, chief engineer, Peabody Coal Co., Chicago, in a paper read in his absence by Raymond Mancha, Jeffrey Manufacturing Co., Columbus, Ohio. Two general heating methods

PERMISSIBLE PLATES ISSUED

Two approvals of permissible equipment were issued by the U. S. Bureau of Mines in May, as follows:

Sullivan Machinery Co.: Type 7-B shortwall mining machine; 50-hp. motor, 250 volts, d.c.; Approval 316; May 7.

Koehler Manufacturing Co., Inc.: Super-Wheat lamp for inspection service; Approval 1015; May 21.

★ ★

are used in fusion welding; i.e., the electric arc and the oxyacetylene torch.

In welding, "results to be obtained depend upon the experience, training and skill of the operator, as well as on the tools, rods and equipment available for the particular job to be undertaken." Welding is employed extensively in both production and repair or maintenance work. On the production side, some work has been done on strengthening cages and skips. "Possibly in the near future we will see a complete cage fabricated from high-strength light-weight alloy steel, with rigid connections made by welding instead of bolting and riveting."

Both types of welding have proved quite versatile in repair and maintenance work, which "may require filling, hard facing, splicing, joining, extending and strengthening broken, worn or bent parts." Two examples are the application of hard facing to dipper teeth and cutting-machine bits. A $4\frac{1}{8}$-in. shaker shaft 16 ft. 8 in. long broke recently and was arc-welded and placed back in service with a time loss of $1\frac{1}{2}$ days, against a week or more for obtaining and installing a new shaft. Breakage of the drive-head bolts, resulting also in breakage of the boxings on a shaker screen, was repaired in $2\frac{1}{2}$ hours, saving a two-day replacement job.

All trunnion irons were broken when two cages were wrecked simultaneously. Even if four spares had been on hand, one day would have been lost. Using welding, the broken trunnions were repaired in two hours. Three spokes on a broken 66-in. V-belt pulley were welded for $6.87 and the pulley was salvaged for immediate use. A pump housing costing $240 burst from one side to the other and was put back in service promptly with an expenditure of $4 for labor and materials. Welded boiler flues have lasted seven years without a leak. Flue sheets have been repaired in place, saving the cost of removing and replacing flues.

Installation of steam or water piping systems often can be facilitated by cutting tees, elbows and other members with a torch and arc-welding. Special assembly units also can be purchased. The crack in the eye of a hoisting-engine connecting rod costing $500 was repaired and a reinforcing strap welded around the end. Satisfactory operation resulted in strengthening the other connecting rod the same way.

As compared with emergency jobs, saving time is not so vital in routine maintenance and repair work, although where the welding job frequently is repeated a nice saving over other methods often can be shown. "Thus, for locomotive tires, solid wheels and axles, we have two installations of automatic arc-welding heads with a rotating device for the wheels." Worn tire and wheel treads are filled and the axles brought back to standard size. "Since 1931, we have filled 2,744 tires and 492 axles. We figure that the saving has more than amortized the cost of the equipment and has carried all labor and materials costs. In this connection, a peening hammer was designed, built and so mounted as to peen continuously the fresh bead of the weld.

"Other routine repair is undertaken on jobs where there appears to be a relatively large saving. Our repair, labor and supplies costs combined average about 12 per cent of the new cost of the items welded. For each of the past seven years we have repaired an aggregate of about $90,000 of parts, based on new cost. It is not claimed that all repaired items are as good as new. However, we feel that many of them are strengthened and improved so as to be better than new."

High-Strength Alloys Studied

The possibilities of high-strength aluminum alloys have been studied by his organization in the past year, stated Mr. Thomas, with the idea of eventually incorporating them into skip construction to save approximately 4 tons in skip weight. Tires have been built up by welding for the past seven or eight years, and last year an engineering study showed savings of approximately $12 per pair by this method. Little trouble from breakage of built-up tires has been encountered, he concluded. An opposite stand was taken by Mr. Prudent, who contended that building up tires was false economy, besides greatly increasing the breakage hazard.

If welding is to be employed it is better to go to the solid-steel wheel, in the opinion of D. W. Greene, general superintendent, Perry Coal Co., O'Fallon, Ill.; A. E. Pickard, Mt. Vernon Car Manufacturing Co., Mt. Vernon, Ill., found general agreement with his contention that breakage and other adverse factors in building up tires or wheels is not in the process itself but in the way the welding is done, whereas Mr. Anderson was of the opinion that the new tire is better in the long run.

Bituminous-coal preparation has undergone numerous waves of activity and recession, declared William C. McCulloch, chief chemist, United Electric Coal Cos., Duquoin, Ill. This has been particularly true in Illinois, where early coal washing was primarily for coking or metallurgical purposes. Present growth in the State, in comparison, is due to "the need for better preparation of steam sizes for use in both industrial and domestic-stoker installations."

As in the early days, preparation men

now are interested primarily in the problem of slate removal or its equivalent, although at present interest is centered not so much on the actual mechanical operation as on "economical removal of impurities in large-capacity units with a minimum loss of coal. Mechanical progress, with the application of engineering design, has resulted in the growth in the 10-tons-per-hour plant of 1870 into the recent 1,000-tons-per-hour plants operating at much higher efficiency." One of the outstanding features of present-day washing-plant design is incorporation of automatic controls to almost eliminate the human element. Special alloys reduce maintenance and facilitate an uninterrupted flow of material.

Analyzing the flow of coal through a modern plant, Mr. McCulloch pointed out that some mines are washing coal up to 6 in., supplemented by hand picking of the washed material in a number of instances to remove from coal for domestic use pieces objectionable from the appearance standpoint, although clean coal from the washer standpoint. Crushers are used to convert coarse coal to screenings and in many cases the larger nut sizes also, loading nothing but 1¼-in. screenings.

"The tendency to wash a wide range of sizes in a single operation seems to have reached a practical limit and there is at the present time a swing back to a narrower size range. . . . It has become evident that removal of some of the fine dust, whether accomplished pneumatically or as a step in the washing process, improves the combustion characteristics of the screenings." Mechanical and heat dryers, chemicals and oil are being used to prevent freezing of the finer washed sizes. Dustless treatment with oil is growing, but more research is necessary. Chemical control laboratories have become a part of the modern plant.

Consumer Wants Low Cost

"The consumer of coal is not interested in the efficiency of a cleaning plant nor in the lowest ash that it is possible to get from a seam of coal. He is interested in low cost per pound of steam, and uniformity is the basis of that low cost. It remains for the coal producer to establish the economic point of separation for his particular coal, and once the quality has been established it should be maintained rigidly. The ability to produce day after day coal of definite combustion characteristics and unvarying quality is the purpose of modern coal preparation, and those plants designed to give these results regardless of the variable characteristics of the feed coal are the ones that will operate most successfully."

Preparation and cleaning of coal for steam raising has been marked by considerable activity recently, H. F. Hebley, Commercial Testing & Engineering Co., Chicago, pointed out in a written discussion read in his absence by Joseph Pursglove, Jr., United Engineers & Constructors, Inc., Philadelphia, Pa. However, "if the whole transaction is to be sound, the increased value of the coal in the plant must be sufficient to defray the cost of preparation." Removal of the fines, for which some market must be found if they are not to be wasted, poses the same question. Coal uniformity is of great importance in steam-plant operation.

H. H. Bubb

In washing large coal (6x4- or 6x3-in.), the producer may suffer a disadvantage because the consumer in many cases is not familiar with coal-preparation principles and still judges by appearance. Also, "are we justified in asking coal-cleaning equipment to work on these large sizes" when the job possibly could be done more efficiently other ways? At any rate, the subject "should be studied candidly."

To get a true picture of cleaning-plant performance, "the proper method . . . is to check the variation from car to car of the coal being shipped. If the coal is uniform, then the plant is performing satisfactorily." Freezing is an important consideration in shipping washed coal. "Generally speaking, centrifuging is cheaper than evaporating the moisture, so consideration should be given in the design of a plant to the installation of both types of equipment, placing the centrifugal dryers ahead of units of the thermal type." The dust hazard in cleaning plants, Mr. Hebley contended, will have to be studied seriously in the future.

Bituminous progress depends upon what the consumer thinks of the product, stated K. C. Richmond, editor, *Coal-Heat,* Chicago. And consumers are getting to know more and want more. The value of a coal depends upon what the user gets out of it, and this in turn depends upon the performance of the equipment in which it is burned. Equipment in the average home reflects the fact that such a home in the United States is 32 years old on the average. Poor or obsolete equipment in either the home or the plant results in a large customer turnover and requires careful coal application, which latter is reflected in the increasing number of coal-company fuel engineers.

In the domestic market, people are not too well satisfied with what they get, as evidenced by the fact that oil-burner sales rose to a new high in 1936 and are running 42 per cent ahead in 1937. Other competition is coming from oil-fired space heaters (400,000 in 1936), gas and electric hot-water heating and cooking. Also, although air-conditioning is 80 per cent heating, the public is being sold the idea that conditioning is impossible without gas- or oil-fired combination heating-cooling units. Of the 30,000,000 United States homes, 8,500,000 have furnaces, 3,500,000 have boilers and 15,000,000 have stoves or similar heating units. Consequently, obsolete furnaces, stoves, space heaters, etc., still are an important coal outlet.

The home owner's chief fuel requirement is comfort, and this is helping the stoker, which now has won to a position of definite public acceptance. Over 150,000 units will be sold in 1937, of which one out of five will replace gas or oil. Comfort is the No. 1 argument for stokers, followed by convenience and economy. In the selection of a stoker coal (see also p. 342 of this issue), the home owner is swayed primarily by dustless treatment, ease of operation and the recommendation of the stoker dealer or salesman. Operators of commercial establishments, on the other hand, place price per ton first. The coal merchant, in selecting stoker coal, considers dependability and freedom from complaints first, followed by the reputation of the coal in the community, special preparation or sizing, and cost per ton.

Personal Notes

R. Laird Auchmuty was admitted to the firm of Eavenson & Alford, mining engineers, Pittsburgh, Pa., on June 8. At the same time the firm name was changed to Eavenson, Alford & Auchmuty.

William W. Bayfield has been appointed executive secretary of the American Wholesale Coal Association. A native of Terre Haute, Ind., Mr. Bayfield was formerly connected with the Lord & Thomas advertising agency, joining the former Bituminous Coal Commission in 1936 as economist and becoming assistant secretary of the new commission.

E. W. Bratton, formerly general sales manager, W. J. Rainey, Inc., western Pennsylvania bituminous producer, has been appointed vice-president in charge of sales of that company.

H. H. Bubb, formerly general superintendent of coal mining for the American Smelting & Refining Co., Cokedale, Colo., has been made general manager of coal mining for the company with headquarters at El Paso, Texas.

Thomas H. Butler, superintendent of No. 4 mine of the Union Pacific Coal Co., Rock Springs, Wyo., has been appointed supervisor of all the company's mines.

C. T. Carney, vice-president, Scandia Coal Co., Des Moines, Iowa, has been

elected a director of the National Coal Association.

I. A. CROWDER has been made superintendent at the Phico mine of the Winisle Coal Corporation, Logan, W. Va.

W. W. DARTNELL, formerly general manager of mines, Valley Camp Coal Co., and more recently in consulting practice, has joined the staff of the Sullivan Machinery Co., Claremont, N. H., as assistant manager of the mining machinery division.

HENRY T. DEBARDELEBEN, president, DeBardeleben Coal Corporation, Birmingham, Ala., was elected a director of the National Coal Association at a meeting of the board on May 26.

WILLIAM DOVER has been appointed foreman at the Wacomah mine of the Wacomah Coal Co., Amigo, W. Va.

T. B. DRYER has been promoted to superintendent of the Acmar division of the Alabama Fuel & Iron Co., St. Clair County, Alabama, vice Charles H. Shepherd, resigned.

LYMAN FEARN, safety engineer for the Southern Wyoming Coal Operators' Association, has resigned to take a position as distribution agent for an oil company.

C. R. GARRETT, formerly mine superintendent, Boncarbo mine, American Smelting & Refining Co., Cokedale, Colo., has been appointed general superintendent, vice H. H. Bubb, promoted.

ARNOLD GRIFFITH has been reappointed chief inspector of the Missouri Bureau of Mines. A resident of Excelsior Springs, Mr. Griffith also is secretary-treasurer of the United Mine Workers in Missouri.

B. F. GRIMM, formerly consulting electrical engineer for the Koppers Coal Co. interests, has been appointed sales engineer for the Westinghouse Electric & Manufacturing Co., with headquarters at Denver, Colo.

M. E. HALL has been made foreman at the No. 33 mine of the Pocahontas Corporation, Bishop, Va.

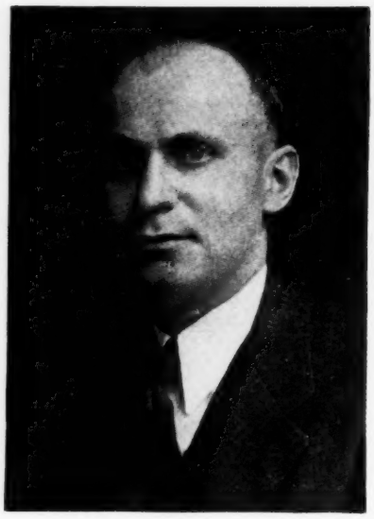
G. W. HARRIMAN, formerly master mechanic and chief electrician, has been appointed superintendent of the Valier mine, Valier Coal Co., Valier, Ill., vice D. W. Jones.

GEORGE B. HARRINGTON, president, Chicago, Wilmington & Franklin Coal Co., Chicago, has been elected a director of the National Coal Association.

H. R. HONAKER has been named foreman at the New Century mine of the New Century Coal Co., Ragland, W. Va.

H. F. HOWENBY has been appointed superintendent of the Terry mine of C. A. Brockman, Inc., Raleigh County, West Virginia.

D. W. JONES, formerly superintendent of the Valier mine, Valier Coal Co., Valier, Ill., has become superintendent of the Kings mine, Princeton Mining Co., Princeton, Ind., succeeding William Hurst.



W. W. Dartnell

WILLIAM KENNEDY has been made superintendent by the Bradshaw Coal Co., McDowell County, West Virginia.

ROBERT W. LEA, of Chicago, has been named to succeed John C. Cosgrove as president of the West Virginia Coal & Coke Corporation, which operates in Logan County and northern West Virginia. Formerly identified with N.R.A. as an assistant administrator under General Hugh S. Johnson, Mr. Lea has been a colonel in the army, a banker, and has had an extensive business experience.

GEORGE J. LEAHY, vice-president, Republic Coal & Coke Co., Chicago, was elected a director of the National Coal Association at a meeting of the board on May 26.

VINCENT C. LOMBARDI, recently service engineer for the Jersey City (N. J.) Coal Co., has become a member of the field staff of Anthracite Industries, Inc.

J. A. MAIER has been appointed foreman at the Costanzo mine of the Wheeling Coal Co., Wheeling, W. Va.

A. M. MARSHALL has been made superintendent at the Dayton mine of the Dayton Coal Corporation, Sprigg, W. Va.

JOHN MCGREAVY, assistant mine manager at Zeigler No. 1 mine of the Bell & Zoller Coal & Mining Co., Zeigler, Ill., has resigned to accept a position as mine manager of the West Mine Coal Corporation, West Frankfort, Ill.

W. M. MCPHERSON has been named general mine foreman at the Affinity and Big Stick mines of the Pemberton Coal & Coke Co., Raleigh County, West Virginia.

I. W. MILLER, formerly coal mining engineer for the Tennessee Coal, Iron & Railroad Co., has been made chief engineer of coal mines, succeeding W. A. Hamilton, resigned.

L. W. MITCHELL, executive secretary of the Southern Wyoming Coal Operators' Association, has been selected as secretary of the Central Western Shippers' Advisory Board.

VERNON O. MURRAY has been named superintendent of No. 4 mine of the Union Pacific Coal Co., Rock Springs, Wyo., vice Thomas H. Butler, promoted. R. R. KNILL succeeds Mr. Murray as safety engineer. MANUEL GRILLOS has been made assistant safety and ventilation engineer.

ELWOOD B. NELSON, formerly coal washer engineer, Tennessee Coal, Iron & Railroad Co., Jefferson County, Alabama, has been appointed superintendent of washeries.

C. E. PAULEY has been appointed superintendent at the No. 10 mine of the Kelleys Creek Colliery Co., Ward, W. Va.

RENTON PENN has been made superintendent at the No. 2 mine of the Detroit Mining Co., Gordon, W. Va.

EUGENE PRUDENT, SR., formerly a Joy boss, has been made assistant mine manager at Zeigler No. 1 mine of the Bell & Zoller Coal & Mining Co., Zeigler, Ill.

JOHN RAYMOND has been named mine foreman at the Dayton mine of the Dayton Coal Corporation, Sprigg, W. Va.

WILLIAM RICHARDSON, JR., formerly superintendent of coal washeries, Tennessee Coal, Iron & Railroad Co., Jefferson County, Alabama, has been appointed to the newly created position of mechanical engineer in the coal-mining division.

W. H. SHEPHERD has been appointed general mine foreman by the Bradshaw Coal Co., Bradshaw, W. Va.

ARTHUR WALDMAN, formerly assistant superintendent, Hamilton mine, Tennessee Coal, Iron & Railroad Co., Pratt City, Ala., has been made superintendent.

A. J. WALKER has been made general superintendent by the Slab Fork Coal Co., Slab Fork, W. Va.

ROBERT WOOD, formerly assistant to the president, in charge of operations, W. J. Rainey, Inc., operating in western Pennsylvania, has been named vice-president in charge of operations by that company.

A. B. JESSUP, vice-president and general manager, Jeddo-Highland Coal Co., was elected president of the Anthracite Section of the American Institute of Mining and Metallurgical Engineers at the spring meeting, held May 28 at the Wyoming Valley Country Club, near Wilkes-Barre, Pa. R. Y. WILLIAMS, consulting engineer, Pottsville, was elected vice-president.

HARRY LAVIERS, vice-president, South-East Coal Co., was elected president of the Big Sandy-Elkhorn Coal Operators' Association at its annual

meeting. Other officers chosen are: vice-president, B. F. REED, vice-president, Turner Elkhorn Mining Co.; treasurer, S. B. HOSMER, president, Elkhorn Collieries Corporation; secretary, H. S. HOMAN (reelected).

M. F. PELTIER, operating vice-president of the Peabody Coal Co., has been elected president of the Illinois Coal Operators' Association. He succeeds W. J. Jenkins, president, Consolidated Coal Co.

Colorado Has "Guffey" Law

Governor Teller Ammons, of Colorado, has signed the "little Guffey coal act" (S.B. No. 1) passed by the State Legislature at the session just closed. The bill permits adoption of a bituminous coal code with penalties up to $500 for violation, collective bargaining for labor, and price fixing for producers, under the Industrial Commission. Prior to its passage by the Legislature the measure was amended to strip the Public Utility Commission of power to allocate production, which was opposed by small operators.

Starting-Time Row Settled

The Anthracite Conciliation Board of Pennsylvania issued a ruling on May 29 granting demands by miners that the afternoon shift at the mines start immediately following the end of the preceding shift. The ruling, which became effective on June 1, settled a three-weeks strike of more than ten thousand miners employed by the Philadelphia & Reading Coal & Iron Co. in the Shenandoah Valley. With the introduction of the seven-hour day in the anthracite region the men on the afternoon shift wanted to start work at 2:30 p.m., but when the company insisted that the starting time of 3:30 be retained, as under the eight-hour day, the men struck. The men had returned to work on May 26 pending action by the Conciliation Board.

New Wage Pact in Illinois

A new wage agreement based on the Appalachian agreement was signed June 15 in Chicago by representatives of the Illinois Coal Operators' Association and District 12, United Mine Workers. Besides providing for a 10 per cent increase in minimum wage rates the contract calls for equal division of work and recognition of the U.M.W. as the sole bargaining agent.

The new pact, which was reached after ten weeks of conferences behind closed doors, is for two years retroactive to March 31, when the old contract expired. The mines have remained in operation during the negotiations, the operators having voluntarily increased wages pending ratification of a final agreement. Meantime, negotiations between the Progressive Miners and the Illinois Coal Producers' Association continued in Springfield.

Mechanization and Safety Hold Stage At Rocky Mountain Convention

MECHANIZATION and safety dominated the program of the 35th regular meeting of the Rocky Mountain Coal Mining Institute, held at the Cosmopolitan Hotel, Denver, Colo., May 31–June 2. This meeting—the largest in the history of the organization—backed up the safety discussions with resolutions protesting against inadequate appropriations for the work of federal and State safety agencies.

Motion pictures illustrating the control mechanisms and operation of a Joy and a Jeffrey L400 loader prefaced the mechanization discussions. "Coordination of machines, methods and men in mechanical loading," said E. H. Johnson, manager of sales, loading-machine division, Jeffrey Manufacturing Co., following the second presentation, "requires time study of the job from every angle, intelligent analysis of findings and prompt action to correct indicated faults." While certain delays may be considered inherent in mining, "an alert management can do a lot to anticipate their occurrence and thereby minimize their harmful effects."

Under a "nearly ideal" division of time a mobile loading unit "manned by capable miners and bossed by a smart foreman" should be loading 40 per cent of the shift. At some operations, the average is 42 or 43 per cent; one mine recently hung up a record for single-shift loader performance with one machine by loading 49 per cent of the time. The text of Mr. Johnson's paper appears on page 317.

Experiences with conveyor mining in thin-seam Colorado sub-bituminous coal, described by proxy at Cincinnati a few weeks ago (*Coal Age*, June, 1937, p. 262), were related in person by T. E. Jenkins, president, National Fuel Co., at Denver. Development work was started at one National mine in April, 1936, with two shaking conveyors; three more units were added last summer. The seam has a very tender roof and a hard bottom. All haulage entries are brushed to permit timbering and to provide sufficient height for conveyor loading points and for haulage.

Since development began, 23,700 ft. of narrow work (haulage entries, aircourses, breakthroughs and room necks) and six panel entries have been driven. The equivalent of 50 rooms 20 ft. wide on 40-ft. centers have been driven from these panels and intervening pillars have been extracted. As the work progressed, explained Mr. Jenkins, roof and seam conditions made it necessary to change the original development plan. Although the company later expects to reach 5-ft. coal, the major portion of the seam so far extracted has been under 4 ft.

Conveyors Only Possible Method

Conveyors have made it possible to work a seam which, Mr. Jenkins was certain, could not have been operated by hand loading. Rooms were driven to their destination and the intervening pillars extracted in ten to eleven days on a three-shift-per-day basis. The percentage of extraction will average 25 per cent higher than for similar areas in the same seam adjacent to this mine where the coal was 6 to 10 in. thicker but was loaded by hand.

Machines have been operated on a three-shift basis. A unit crew consists of four men. The cycle is continuous; i. e., each crew begins where the preceding crew leaves off; each crew averages about three cuts per shift. The maximum linear advance in an entry from which only coal was taken was between 60 and 65 ft. for three four-men shifts. The average for the mine has been less, however, because of timbering and the delivery of coal from unbrushed entries by the right-angle drive. At present "we are endeavoring to drive unbrushed entries by means of swivels and using a 45-deg. breakthrough from the brushed to the unbrushed entry."

Prior to adopting the conveyor system, it was necessary to drive panel

★ ★

Rocky Mountain Officers

• D. G. BROWN, general superintendent, Spring Canyon Coal Co., was elected president of the Rocky Mountain Coal Mining Institute at the Denver meeting last month. He succeeds Glen A. Knox, general superintendent, Gunn-Quealy Coal Co.

Thomas Allen, chief mine inspector, State of Colorado; Sharp Hanson, president, Gallup & Southwestern Coal Co., Gallup, N. M.; Fritz Nyman, chief engineer, Utah Fuel Co., Salt Lake City, Utah, and O. G. Sharrer, superintendent, Hanna No. 4 mine, Union Pacific Coal Co., Hanna, Wyo., were made vice-presidents. H. C. Marchant, president, Pinnacle-Kemmerer Coal Co., was re-elected secretary-treasurer.

The members of the new executive board are: Floyd R. Pool, vice-president and general manager, McNeil Coal Corporation, Denver, Colo.; William E. Schlessinger, general superintendent, Victor-American Fuel Co., Denver, Colo., Virgil McKnight, Albuquerque & Cerillos Coal Co., Albuquerque, N. M.; George Miksch, general superintendent, Defiance Coal Co., Albuquerque, N. M.; A. C. Watts, assistant manager, Utah Fuel Co., Salt Lake City, Utah; W. N. Wetzel, general superintendent, United States Fuel Co., Hiawatha, Utah; R. R. Knill, safety engineer, Union Pacific Coal Co., Rock Springs, Wyo., and William Wilks, Union Pacific Coal Co.

entries one winter for use the following winter. This meant high maintenance costs. Panels now can be completed and extracted on the retreat system in a comparatively short time. Mr. Jenkins estimated that entries developed by shaking conveyors "can be driven in one-third the time used in driving them by hand." A neighboring mine had taken up 24 in. of bottom brushing for 175 ft. with four-man crews on shaking conveyors and duckbills in three shifts; it would have required at least 400 man-hours to do this same work by hand. Mechanization at Union Pacific Coal Co. mines, said George B. Pryde, vice-president, has resulted in no material increase in power costs, while the concentration due to mechanization has lowered costs for over-all maintenance.

Operators turning to mechanization, stated C. L. Barker, E. I. duPont de Nemours Co., do so to achieve: (1) the increased safety possible through concentration and closer supervision of working places; (2) decreased costs to meet competition and (3) maintenance of lump-coal preparation in line with consumer demand at this decreased cost. From the standpoint of shooting, "the dynamite permissible explosive is the only explosive which has successfully filled all these requirements."

Further improvement in the enviable safety record of permissibles must come in part from greater attention to seemingly minor details. For example, the menace of stray currents in electric firing can be eliminated by using an electric squib with a 3-in. wire. The blasting wire can be tested with the squib for such currents before the wire is attached to a primed detonator at the face. Should there be sufficient stray current in the wire to fire the detonator, "the electric squib will make a small, harmless flame when touched to the blasting wire."

Improper tamping invites blown-out shots. Poor tamping material results in overloaded holes, causing poor lump-coal preparation, excess gas, smoke and increased explosive costs. Bureau of Mines tests (Technical Paper 17) show tamped moist sand to be 89.9 per cent efficient; tamped moist fireclay, 89.6; tamped dry sand, 67.6; and tamped dry fireclay, 71.4 per cent efficient.

A distinction should be made between smoke and fumes. Too often, said Mr. Barker, a permissible doing very good work has been discarded on the assumption that the fact it produces a little more smoke than some other brand is indicative of a larger percentage of harmful gases. But carbon monoxide, normally evolved in very small quantities from the detonation of permissible explosives, is both invisible and odorless. Smoke and gas can be largely eliminated by correct ventilation.

Correct positioning of boreholes, cleaning bugdust from undercuts and careful gaging of explosive charges will increase the percentage of lump yield, asserted Mr. Barker. So will the cutting of straight ribs. In mechanization, there is a tendency to rush an undercut and this may cause gripped ribs. Gripping the undercut up to 12 in. will not affect the blasting, but when the gripping extends beyond 15 in. it has a decided effect.

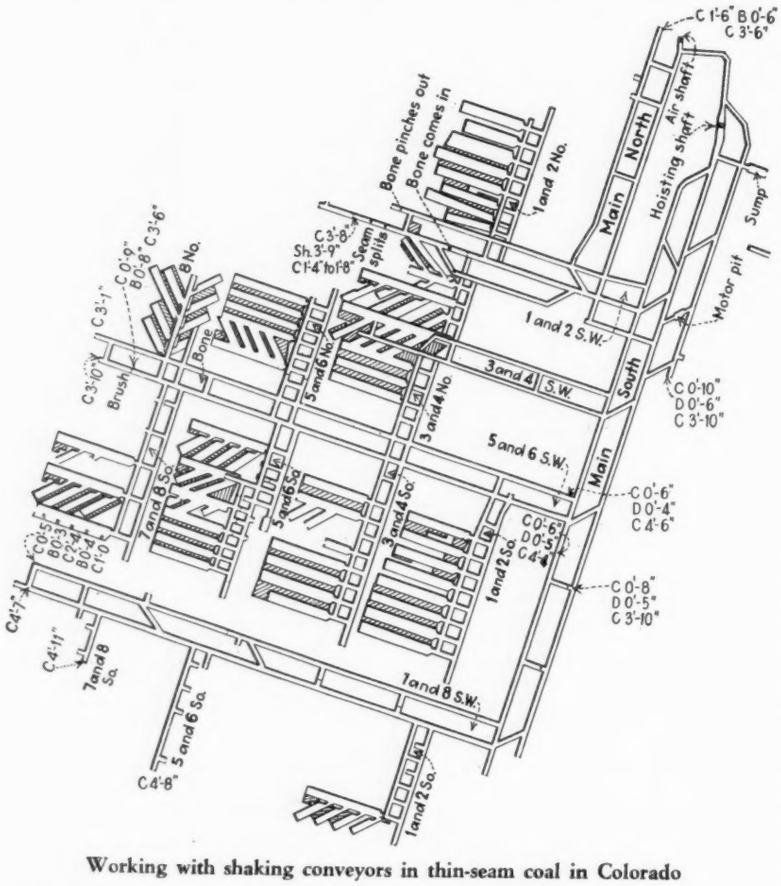
Black or pellet powder, explained Mr. Barker, deflagrates or burns when ignited in the borehole; permissibles detonate or explode. An overload of powder, therefore, "will not have the tendency to shatter the coal the full amount of the overload charge; with a permissible which detonates, an overload has 100 per cent effect on shattering the coal." But lump coal yields attainable with powder can be closely approached "if the loading supervision of the permissibles is such as to give a minimum of overload in the borehole."

Short-term progress in accident prevention easily may be obscured by the action of other forces. But when the review is extended over the past thirty years, declared W. P. Yant, director of research, and J. T. Ryan, Jr., Mine Safety Appliances Co., in a paper read by the latter, "the gradual progress of safety in our mines becomes apparent." From 1906 to 1915, for example, fatalities per million tons of coal produced were 5.30; in the next decade the rate was 3.91, and for the ten-year period ended with 1935 it was 3.39. Preliminary estimates indicate a still more favorable showing for 1936.

Safety Equipment Imported

Prior to 1914, practically all safety equipment used was imported—and the list was scanty, hardly extending beyond the Wolf safety lamp, Draeger and Fleuss-Proto breathing apparatus and the Vane anemometer. Today, equipment made in this country includes electric cap lamps, breathing apparatus, all-service gas masks, rock-dust distributors, carbon-monoxide and methane detectors, inhalators for asphyxiation treatment, convenient first-aid kits, protective clothing, dust respirators, modern electrical anemometers, permissible equipment and almost innumerable special devices.

Mine-management practices, safety procedure and mining laws also have progressed, "so that the benefits of improved safety appliances could be multiplied many fold through their proper application by management." How equipment developments influence mining practice, continued Mr. Ryan, is illustrated by Pennsylvania bills classifying mines according to gas content. Such classification requires accurate information on methane content; develop-



Working with shaking conveyors in thin-seam coal in Colorado

Originally it was planned to develop the mine for rooms driven north from entries driven west to take advantage of the grade in favor of the pan lines, and the 3d and 4th West entries were driven with that plan in mind. Experience showed, however, that rooms stood up more satisfactorily when driven east and west than north and south; the plan accordingly was changed to the panel system as illustrated in the development from the 5th, 6th, 7th and 8th West entries.

Smoky Explosives

• "ANY permissible explosive will make large quantities of smoke or harmful gases, or both," C. L. Barker, E. I. duPont de Nemours Co., told the Rocky Mountain Coal Mining Institute, "under the following conditions:

"1. If used after absorbing moisture in the mine or a damp storage magazine;

"2. If the quantity used for a charge is in excess of that required to do the work;

"3. If the tamping is insufficient to assure complete detonation;

"4. If tamping is of an inflammable nature;

"5. If the charge is permitted to stand too long in a wet borehole."

★ ★

ment of an accurate portable indicator makes possible rapid and complete examination of the methane content in the various air splits and at the face. Without this instrument, reliance would have to be placed on laboratory examination of face samples—an inconvenient, time-consuming and, unless a large number of samples is collected, inadequate process.

Invoking the muse of history in terms which kept his audience chuckling heartily, Thomas Allen, chief coal mine inspector, Colorado, paid ironic respects to timbering, haulage, illumination and blasting practices in some mines. First came a dissertation on "trees" which, he announced, had nothing to do with the well-known poem, but was a plea for timbers squared and cut to length before they were sent underground. Leaving that job to underground men was both uneconomical and dangerous, as miners could not be expected to be skilled axe men. Squared crossbars, without notches, should be used in temporary timbering, and all wedges, cap-pieces and blocks should be made on the outside.

America's contribution to animal husbandry—the mule—should give way to the storage-battery locomotive. Mules, observed Mr. Allen, are not only perverse and at times dangerous but underground barns with hay stored in large quantities are deadly fire hazards. Cherry, in 1909, and Leyden, in 1910, "are grim reminders of the horrors which might result" from such installations. Spragging, he said, must be a throwback to the days when prehistoric man hurled poles between the legs of dinosaurs to trip the beasts as they lumbered after their prey. The practice is both dangerous to men and destructive to equipment. Equip mine cars with brakes, he counseled, and lay out haulage roads to avoid excessive grades.

Bad lighting long has been recognized as a fruitful source of accidents, but coal men, Mr. Allen charged, "still persist in operating mines with the poorest possible illumination." Improvement could be effected—frequently at small cost—by: (1) Use of 66-candle-power headlights; (2) whitewashing around junction switches and other places where there is fast haulage, and (3) rock-dusting with light colored dust. Black powder should be eliminated. While permissibles may produce more slack, "a little neglect" by blasters using black powder may blow up the mine. Moreover, the quantity of slack may be reduced materially if more care is taken in drilling and firing. He proposed double shooting; i. e., firing the burster holes first and not charging the rib shots until after the action of the burster shots is known. This would deter overcharging.

Unless the worker can mix brains with his labor, his intelligence will seek other outlets. And these outlets, remarked Mr. Allen, may be productive "of disturbance and insurrection." Nevertheless, some operators still cling to the idea that "it is better to use physical stamina than mental alertness in mining." What really is needed is more training, continued improvement in working conditions, "opportunities for advancement in the profession and more relaxation in the way of vocational and other training." Manufacturers should cooperate with mine management in this program by helping to sell the idea of labor-saving devices to the rank and file of mine workers.

Safety conditions in coal mining are definitely changing for the better, declared Dan Harrington, chief, health and safety branch, U. S. Bureau of Mines. A new record in fatality rates was hung up in 1933; while 1934 and 1935 were not quite so good, tentative figures for 1936 are better than 1933. Two major disasters costing 27 lives gave 1937 a bad start; figures for the first three months, nevertheless, show a fatality rate below that for the first quarter last year.

Safety Improvement Forecast

Because "safety is becoming an integral part of operation," Mr. Harrington thought that the future would show a reduction of 50 to 75 per cent from present fatality rates. That this is not impossible is evidenced by the fact that hundreds of mines now go through the year without a fatality and many without a lost-time accident. More and more, operators are realizing that accidents are an expensive waste. One company which spent 11c. per ton in hospitalization and compensation ten years ago, for example, cut that cost to less than 2c. during the past three years.

Much remains to be done. While mining still has the worst severity and frequency rates, the accident record of the United States as a whole is excelled only by that of Chile. Inviduous comparisons with other countries in mining, however, should be taken with a grain of salt. Despite the praise frequently heaped upon Great Britain, its mine safety record, said Mr. Harrington, is six to seven times worse than the record for British industry as a whole. In striving for improvement here, management must abandon the idea that the miner knows best how to protect himself and must take on the job of educating him in safe practices.

Engineering, education and enforcement are basic in any successful safety program, asserted R. R. Knill, safety engineer, Union Pacific Coal Co. Engineering comes first with laying out the mine for safety and operating efficiency. Methods to be used in installing machinery, timbering, ventilation and handling of explosives are covered in a "Book of Standards" placed in the hands of all officials. The duties of the men in the various occupations are set forth in a "Book of Rules" given to each employee.

"Education is knowing one's job." Each man must be trained to work safely. All employees are expected to attend the monthly district safety meetings and are required to take first-aid training. Individual responsibility in safe working is continuously stressed. The section foreman, continued Mr. Knill, has the greatest opportunity to enforce safety regulations and "his knowledge of and attitude toward these rules will determine to a large extent the success of the program." But he must be given the proper backing by his superiors in handling violations "or he will lose value and incentive in his efforts for safety." While education and persuasion may be helpful, to be effective, the wearing of protective clothing must be made compulsory.

"Continuing safety means continuing effort," said Gilbert C. Davis, manager, Stag Canon branch, Phelps Dodge Corporation, in a paper read in his absence by Robert Dalrymple, Walsenburg, Colo. Since his previous review of the Stag Canon record (*Coal Age*, Vol. 39, p. 123), Mr. Davis explained, the percentage of hand-loaded coal had been cut from 50 to 32.5 per cent; scraper-loaded output had increased from 33 to 37 per cent and a mobile loading unit accounted for 13.5 per cent of the 1936

★ ★

Tom Allen Says

• CONTINUOUS SPRAGGING makes coal mining the only industry where the hexagon or octagon is used as a shape for a wheel in preference to the circle.

Despite the Biblical command, "let there be light," coal producers still persist in operating mines with the poorest possible illumination.

In China, black-powder firecrackers are used to blast devils away from men; in coal mines, men may be blasted to the devil by black-powder cartridges causing a mine explosion.

Some appear to have the old idea that it is better to employ brute strength than mental alertness in mining. History shows that riots and revolutions originate with the classes that are compelled to depend wholly on physical exertion to win a livelihood and must seek outlets for their intelligence in other channels.

tonnage. Back in 1924, when the safety program was inaugurated, lost-time injuries per 1,000 shifts averaged 1.656; an all-time low of 0.055 was attained in 1931; the 1932-36 average was 0.13. A lost-time injury is one in which the worker is unable to resume his regular employment the day following the accident.

All lost-time and no-lost-time accidents are investigated and analyzed. If faulty practices are uncovered, the operation is studied and "improved practices are developed and made standard." If the worker is at fault, the situation may be handled by issuing additional instructions. But, if investigation discloses violation of standard rules or practices known to the worker, penalties are applied. A worker who sustained an eye injury and his buddy were laid off fifteen days for failing to wear goggles while splicing rope, and two men were dismissed for picking coal without goggles. Foremen, too, are subject to discipline.

Prompt administration of discipline is important because it heads off injuries. Good housekeeping also should be emphasized: haulageways should be free of spillage, aircourses free from sloughing; wiring should be well installed and maintained. Cars off tracks mean either poor track or cars in poor repair—both inexcusable, but giving a warning which, if heeded, will prevent a catastrophe.

Pamphlets Contain Safety Rules

Stag Canon rules are published in pamphlet form and revised when necessary. Each worker has a copy and must pass periodical examinations on them. First-aid training also is required and all men are retrained approximately once each year; the course is given by advanced workmen, but examinations are conducted by a representative of the Bureau of Mines. First-aid contests usually are held each fall. Safety is further preached in "Stag Canon Safety Notes," a mimeographed sheet signed by the general manager and issued at irregular intervals.

Summarizing the results of the program, Mr. Davis stated that during the first five years there was 3,315 tons of coal mined per lost-time injury; during the last six years, output per lost-time accident has averaged 26,272 tons. Compensation costs during the first period were 2.6c. per ton; despite increasing compensation rates, the 1931-36 average was only 1c.

Southern Wyoming producers, said Lyman Fearn, safety engineer, Southern Wyoming Coal Operators' Association, in a paper read by D. K. Wilson, Rock Springs, have launched a joint program to improve the record in their part of the State. Wyoming has a good set of laws which furnish the start for a safety code. Every company, however, should have its own book of rules; these should be discussed at safety meetings and the men should be examined frequently to test their knowledge of these regulations.

Nothing, declared Mr. Fearn, pays greater return on the investment than ample air. Rock-dusting should be kept up close to the working face and frequent analyses made of the dust. Electrical equipment should be installed and maintained in accordance with the provisions of the underwriters' code, and no electrical appliance should be operated until its installation has been approved by the mine electrical and safety engineers. Haulage, too, needs close attention; rail should be heavier and better aligned. There should be ample clearances. Flying switches should be taboo; careless transportation workers must be educated.

D. G. Brown
President-Elect, Rocky Mountain Coal Mining Institute

Practically all southern Wyoming miners use protective hats, but only about 30 per cent have goggles and 50 per cent wear safety shoes. So the goal here is 100 per cent usage. All men are to be given first-aid training to make them safety-minded. Eventually it is hoped to make such training a condition of employment. Organization of safety clubs and giving of awards are being encouraged. Each foreman must be held responsible for workers after injuries; in too many cases, a two-weeks' injury develops into a two-months' case because the foreman has not visited the injured man at his home. A general clean-up and paint-up campaign "will have its effect on safety."

Tracing Cardox developments since it was first introduced about fifteen years ago, H. R. Ellis, division manager, Safety Mining Co., emphasized that the disruptive force exerted by this blasting agent can be adjusted to meet the requirements of any particular coal by varying the thickness of the shearing disk, the size of the heater element and the quantity of carbon dioxide in the shell. Once these variables are determined, the operator is assured of consistent uniformity of sizes because there is no danger of increased shattering of the face through overshooting.

Other advantages claimed by Mr. Ellis included: increased realization through maximum coarse and minimum fines in the coal shot down; preservation of the inherent structure of the coal, thereby reducing degradation in handling; coal rolled forward from working face, making it more accessible for loading; elimination of idle time at the face because of the absence of smoke and fumes. Ribs and faces are squared up better, eliminating the hazard of overhanging coal. With daytime blasting, the efficiency of the miner is increased. Production costs are lowered through concentration of output and reduction of necessary haulage, ventilation, supervision and miscellaneous supplies.

A quick picture of how the National Coal Association is working to preserve and expand bituminous-coal markets was presented by Harry L. Gandy, Jr. One recent major step was the establishment of a department of engineering. On the transportation side, Mr. Gandy mentioned the successful fight against the freight-rate surcharge and the still undecided battle against a general increase in coal rates. Tax work is another important activity. The association also keeps close watch on the legislative front; it is promoting a bill to extend the tax on imported fuel oil and is fighting proposals to eliminate fuel oil and natural gas used for industrial purposes from pending regulatory measures.

Colorado "lignite," said Robert F. Throne, superintendent, Valmont power plant, Public Service Co. of Colorado, at the morning session June 1, has a low grindability, calling for a relatively high power consumption in pulverization. Moisture content is between 20 and 28 per cent. Because there has been a tendency to pack in the pulverizers, plans now are being made to reduce the moisture range to 16 to 24 per cent. Coal is ground so that 60 per cent will pass through a 200-mesh and 98.5 to 99.5 per cent through a 48-mesh. In the afternoon the delegates visited the Valmont plant.

Stoker Sizes Increase

Following a movie showing the Link-Belt Simon-Carves plant at the Delta (Ill.) Mining Co. (*Coal Age*, Vol. 40, p. 188), George A. Delamater. W. S. Tyler Co., called attention to the increasing use of domestic stoker sizes in the Mid-West and the problems involved in preparing such coal. One operation was sizing to $\frac{5}{16}$-in. x 48-mesh and was selling the minus 48-mesh resultant to cement mills. Another producer was sizing down to 10-mesh. An Indiana mine which had been wasting 30 tons per hour of 0.95-in. x 0 product is now dewatering this material through a 0.95-in. screen and over a 28-mesh. Vibrating screens are being used not only in cleaning fines but on lump, egg and nut.

With regulation now in effect, H. C. Marchant, secretary-treasurer, voiced the hope that the institute might broaden its scope and become a forum for the practical discussion of problems arising under the new law. Unless the operating men intensify their efforts to reduce production costs, remarked Sydney A. Hale, editor, *Coal Age*, the advantages of government price-fixing may be

turned into the greatest handicap ever inflicted on the industry. Government guarantee of price maintenance is no guarantee of sales. Competition must still be met. Price-fixing based on average costs enhances the opportunities of the low-cost mine and works to blot the inefficient operation out of the picture.

Niggardly appropriations for the U. S. Bureau of Mines and many State mine inspection departments were attacked by Burt B. Brewster, publisher *Mining and Contracting Review*. These agencies, he declared, are largely responsible for the improved safety record of the industry and their work should be encouraged. How common raw materials, such as coal, salt and cotton, are used in making plastics, synthetic fibers and a host of other products was shown in a talking picture by the duPont company. Advantages of the electric cap lamp were portrayed in a film by Mine Safety Appliances Co. The Dalton bumper in use at Gauley Mountain Coal Co. was featured in a Watt Car & Manufacturing Co. movie.

In the absence of Otto Herres, vice-president, United States Fuel Co., and chairman of the standing committee on safety, E. H. Denny, U. S. Bureau of Mines, presented an oral report recommending that the institute code, last amended in 1928, be kept open for further revisions for formal action next year. The report was accepted and the following standing committee named to carry on the work: E. H. Denny; E. P. Lucas, president, Bellingham Coal Mines; B. W. Snodgrass, president, Moffat Coal Co.; F. W. Whiteside, chief engineer, Victor-American Fuel Co., and T. E. Jenkins, president, National Fuel Co.

—⟡—

Coal Company Sues Tax Body

Suit was filed in the U. S. District Court at Lexington, Ky., on June 8 by the Consolidation Coal Co. seeking to enjoin the State Tax Commission from certifying tax assessments against the company as a public utility. The complaint contends that the company is primarily engaged in the coal-mining business and it is necessary to operate an electric power plant in connection therewith.

—⟡—

Anthracite Rates Attacked

Forty anthracite producing companies filed a joint complaint with the Interstate Commerce Commission on June 16 that railroad rates for hauling hard coal from the mines in Pennsylvania to New York harbor for transshipment to New England were "unjust and unreasonable." The complainants, which ship more than two-thirds of the entire annual output of anthracite in Pennsylvania, contend that the rates fail to give due weight to the low cost of the service rendered and the decreased value of such service by reason of the severe competition which anthracite must meet from other fuels.

Coal Commission Starts Organization And Promulgates Code

WASHINGTON, D. C., June 19—Machinery for administration of the Bituminous Coal Act has been set in motion, and the 1937 law will soon be in full effect. Order No. 1, providing for organization of the 23 district boards called for in the act, was issued May 26 by the National Bituminous Coal Commission, together with two accompanying forms. Besides providing for the organization of district boards, this order designates acting district secretaries, defines their duties, and sets forth the procedure for accepting membership in the code.

The code, which was to be formally promulgated on June 21 and become effective as of that date, is an exact reproduction of Sec. 4 of the act. Paragraph 6 (a), relating to the duties of acting district secretaries, provides that each should, subject to review by the Commission, "fix a time and place of a meeting for the organization of the district board in conformity with the provisions of this order and of said act, such meeting to be held not earlier than June 22 and not later than June 25."

Producers filing acceptance forms prior to the date set for organization were declared to be qualified to participate in district board elections. In electing board members, the order points out, one vacancy shall be left in the total number to be chosen, the vacancy to be filled by a person selected by the organization "representing the preponderant number of employees in the industry of the district," as stipulated in the act, and an even number of members shall be elected.

The acting district secretaries appointed for the respective districts are:

1. W. A. Jones, Altoona, Pa.
2. B. H. Canon, Pittsburgh, Pa.
3. D. T. Buckley, Fairmont, W. Va.
4. Ezra Van Horn, Cleveland, Ohio.
5. Frank Heath, Saginaw, Mich.
6. George A. Blackford, Wheeling, W. Va.
7. P. M. Snyder, Mt. Hope, W. Va.
8. E. C. Mahan, Knoxville, Tenn.
9. Brent Hart, Madisonville, Ky.
10. J. B. Henderson, Chicago.
11. Jonas Waffle, Terre Haute, Ind.
12. M. G. Youngquist, Des Moines, Iowa.
13. James L. Davidson, Birmingham, Ala.
14. S. A. Bramlette, Fort Smith, Ark.
15. W. E. Blucher, Kansas City, Mo.
16. N. C. Brooks, Denver, Colo.
17. F. O. Sandstrom, Denver, Colo.
18. A. R. Litts, Gallup, N. M.
19. L. W. Mitchell, Cheyenne, Wyo.
20. B. P. Manley, Salt Lake City, Utah.
21. E. M. Hendricks, Bismarck, N. D.
22. M. F. Purcell, Billings, Mont.
23. D. S. Hanley, Seattle, Wash.

In regard to the policy on contracts, the Commission announced on June 10 that bona fide contracts for delivery of coal signed prior to April 26, 1937, would remain in full force and effect until minimum prices were established. "After such minimum prices have been established," the Commission said, "delivery of coal on any such contract will constitute a violation of the code if the contract provides for sale and delivery of coal at a price below minimum prices or in violation of marketing rules and regulations." Contracts entered into prior to June 16, 1933, will not be affected. On sales subsequent to April 26, 1937, and until minimum prices are fixed, no contracts may be made providing for delivery for a period longer than 30 days from the contract date.

The last-named ruling also applies to bunker coal, which the coal act expressly includes within the domestic market. In connection with this ruling, the Commission calls attention to Subsection (e) of Part II of Sec. 4 of the act, which provides that "the domestic market shall include all points within the United States and Canada and car-delivery shipments to the island of Cuba."

Headquarters for statistical bureaus authorized by the Commission are as follows:

District 1, Altoona, Pa.; 2, Pittsburgh, Pa.; 3, Fairmont, W. Va.; 4, Cleveland, Ohio; 5, Saginaw, Mich.; 6, Wheeling, W. Va.; 7, Bluefield, W. Va.; 8, Ashland, Ky.; 9, Louisville, Ky.; 10, Chicago; 11, Terre Haute, Ind.; 12, Des Moines, Iowa; 13, Birmingham, Ala.; 14, Fort Smith, Ark.; 15, Kansas City, Mo.; 16-17, Denver, Colo.; 18, Albuquerque, N. M.; 19, Cheyenne, Wyo.; 20, Salt Lake City, Utah; 21, Bismarck, N. D.; 22, Billings, Mont.; 23, Tacoma, Wash.

Data collated by these bureaus, the Commission pointed out, will be the basis for the establishment and enforcement of minimum prices for which the bituminous industry will depend for successful operation under the code. Since the figures collated by each bureau will reflect a true picture of coal production and marketing within its area, the Commission stressed the importance of the functions of the bureaus and the need for their being manned with trained personnel.

In response to requests that tentative or temporary minimum prices be established in some manner for immediate application, the Commission announced on June 12 that it was advised by its acting general counsel "that there is no authority under the law for the suggested establishment of minimum prices other than in the manner specifically prescribed in the law."

Additional appointments by the Commission include J. O. Smith, of Cincinnati, Ohio, to be acting chief of the marketing division. After some railroad experience, Mr. Smith was connected for thirteen years with the Stonega Coke & Coal Co., was for a time Southern sales manager for the General Coal Co., was a member of the marketing division of Appalachian Coals, Inc., and served on the classification committee under the preceding Guffey act. Former Commissioner George E. Acret has been assigned to special work in the legal division. Norman G. Schmidt, who had been acting secretary of the Commission for several months, also has been assigned to the legal division.

Coal-Utilization Advances Canvassed At Fourth Urbana Short Course

WITH automatic heating with bituminous coal as its major theme, but also covering a wide range of other coal-preparation and utilization problems, the Fourth Short Course in Coal Utilization offered by the Department of Mining and Metallurgical Engineering, University of Illinois, was given at Urbana, Ill., May 25-27, in conjunction with the 51st annual meeting of the Illinois Fuel Merchants' Association. Registration totaled 343 from eighteen States and the District of Columbia.

Characteristics of the major systems of heat distribution, including stoves and heaters, pipeless and piped furnaces, piped furnaces with winter or year-around air-conditioning, one- and two-pipe steam systems, gravity- and forced-flow hot-water systems and one-pipe steam systems with winter or year-around air-conditioning, were analyzed by P. E. Mohn, assistant professor of mechanical engineering, University of Illinois, in opening the three days of discussion.

Psychology Needed in Servicing

Without a knowledge of "Why we do what we do," knowing coal, equipment and firing methods are valueless in servicing complaints, contended C. M. Lewis, Kansas City (Mo.) Coal Service Institute, which was organized in 1927 and since has serviced an average of 1,000 complaints a year for its subscribers. Consequently, the service man must know his psychology and how to apply the proper stimulus to get a favorable response. Excluding certain special classifications, complaints received by the institute fall into four classes: inferior coal, 5 per cent; faulty equipment, 26 per cent; faulty firing, 20 per cent; and unwarranted complaints, 24 per cent.

The rôle of coal in smoke, dust and air pollution was sketched by D. R. Mitchell, assistant professor of mining and metallurgical engineering, University of Illinois, who stated that one method of reducing the output of smoke and dust was well-cleaned and well-sized coal. Legislation, he declared, will not solve the air-pollution problem unless it is arranged so that each community can use its natural fuel; i.e., the cheapest, as a general rule.

Comfort, stated J. E. Martin, manager, stoker division, Link-Belt Co., Chicago, is perhaps the most sensible of all stoker-sales arguments, outranking economy, which not always is a valid reason for purchase of household equipment. Next comes convenience and then economy. The latter, however, should not be overstressed, as selling stokers solely on this argument frequently results in trouble. After economy comes cleanliness, resulting from both smokeless operation and a better opportunity for keeping the basement clean. Price, Mr. Martin felt, is a major factor only in so far as it is within or without the buyer's ability to pay, and when used as the sole inducement is a dangerous merchandising weapon, as it is necessary to secure a proper return if the manufacturer and his wholesale outlets are to prosper and do the necessary research to build a product which will continue to satisfy the purchaser.

Problems in the installation and servicing of the small stoker are quite different today as a result of improvements in stoker design, better coal preparation and more knowledge of installation and servicing methods and pitfalls, said J. McClintock, sales manager, stoker division, Illinois Iron & Bolt Co., Chicago. Sales, installation and service have been materially simplified, with the result that they have been removed from the engineering into the appliance classification, permitting many more people with sales, rather than an engineering, background to undertake distribution and thus increase the sales volume. Mechanical difficulties largely have been eliminated, and service calls now fall mostly in the following classes: adjustment of stoker, now decreasing; adjustment of controls, also decreasing with improvements in design and manufacture; education of the user in the operation of the stoker—proper follow-up is particularly important; calls resulting from imaginary difficulties, unwarranted tampering with the equipment, etc.; exaggerated statements of sales representatives; and unsatisfactory coal. Complaints based on the latter have shown a large decrease in recent years with growing appreciation of stoker problems by producers. However, 50 per cent of all service-department calls still deal with servicing coal, and Mr. McClintock felt that the producing fraternity should give still greater attention to the problem.

Air Conditioning Benefits Coal

Air-conditioning is not new, as its 24th anniversary was celebrated this spring, declared William B. Hughes, manager, automatic heating division, American Radiator Corporation, New York. However, it is now and will continue to be of value to the coal industry, as anything available in this line to competitive fuels is available to coal. Cooling is only one phase of air-conditioning, which takes in ventilation, cleaning, circulation, noise elimination, heating, humidifying, cooling and dehumidifying. In addition, any system should take into consideration an adequate hot-water supply both winter and summer. The major air-conditioning needs at present, however, are heating, humidification and ventilation. Cooling and dehumidification are special phases of the entire conditioning problem, and while commercial and industrial installations have proved economically practicable, cost still is a big stumbling block in residential use. However, residential cooling should show a gradual increase, requiring first, however, new designs in building for insulation, as a general rule.

Special controls for use with steam, hot-water and warm-air heating plants were discussed by F. K. Scoggins, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., in starting off the second day's sessions. Next, A. J. Chouinard, Sahara Coal Co., Chicago, sounded the note that it is not coal which must be sold but heat, and that to do this coal men must capitalize on the utility of their product. More consumer appeal, more glamour, is needed in merchandising coal, declared Mr. Chouinard in detailing a list of improved merchandising methods which might be adopted. Taking the stand that service and results, rather than coal itself, should be stressed, Harry Neal Baum, Fairbanks, Morse & Co., Chicago, discussed advertising of coal and stokers by the retail dealer, and analyzed the characteristics and advantages of the various available media: newspapers and the radio, direct mail, stores, displays, signs and billboards, telephone advertising and salesmen's calls.

Explaining that it is possible to burn high-volatile coals smokelessly in hand-fired furnaces and stoves if the volatile constitutents are distilled off slowly, mixed with the proper volume of air and then burned at a temperature of about 1,200 deg. F., J. R. Fellows, associate in mechanical engineering, University of Illinois, described a newly developed burner (patent applied for) to make possible smokeless combustion with hand-fired equipment.

"What they want in stoker coal" was the theme of an address by K. C. Richmond, managing editor, *Coal-Heat*, Chicago. As a basis for his remarks, Mr. Richmond offered the preference tables given below, which are based on a survey of coal and equipment men and engineers. These tables were supplemented by an additional table showing the relative importance of ten factors in stoker-coal selection in the minds of retail dealers.

Explaining that 80 per cent of all residences are heated with other fuels than coal, James Wallace, Taco Heat-

Factors Governing the Selection of Coal From the Household Stoker User's Viewpoint

Factor	Importance Rating
Dustless treatment	1
Ease of operation	2
Recommendation of the stoker dealer or salesman	3
Minimum non-combustible material (low ash)	4
Recommendation of the coal merchant	5
High B.t.u. content	6
Special sizing	7
Low price	8
Recommendation of other stoker users	9
Freedom from fines	10
Low freight rate	11

ers, Inc., Detroit, Mich., explained the operation of the Taco-Abbott system for supplying year-around hot water using stoker-fired steam or hot-water heating equipment with the necessary controls to prevent heat being sent to the radiators in warm weather. This equipment, he contended, offers new all-year markets for coal.

The anthracite cooperative sales promotion program, which got under way July 1, 1936, was described by A. F. H. Scott, Anthracite Industries, Inc., New York, who stressed the fact that it was built around automatic heating with anthracite. Cooperation with the manufacturer in the development of suitable equipment was emphasized by Mr. Scott, who listed types already approved or under test and stated that thermostats were the theme of the second advertising campaign, which got under way in January and will be followed in the fall by a third campaign featuring modernization of heating and heating equipment.

The use and advantages of portable test instruments and their limitations were discussed by W. H. Pugsley, manager, Carrick Control Division, Hays Corporation, Chicago, in opening the last day's sessions.

Prospects for the utilization of the various chemical constituents of coal were sketched by Dr. F. H. Reed, Illinois State Geological Survey, Urbana, who pointed to a disposition in the chemical industry to synthesize products from simple elements. From the coal-utilization standpoint, the trend in late years, particularly abroad, is toward the development of coal-tar products and the production of liquid fuels by carbonization or distillation, destructive hydrogenation or synthesis from coal-gasification products. As the yield from carbonization or distillation is only a small part of the present demand, it is difficult to visualize these processes alone as the major source of a motor-fuel and lubricating-oils supply. Various estimates place the cost of motor fuel from hydrogenation at 12 to 17c. per gallon, compared with 5c. from petroleum in the United States at present. Of the various synthesizing processes, a number of plants have been erected in Germany employing the Fischer method.

In the United States, gasoline consumption was 30 per cent greater than oil discovery in the period 1931-35, inclusive, and Snyder and Brooks foresee a lack by 1940 and a serious shortage by 1945. When this occurs, other sources of motor fuel will have to be found, although exploitation must wait until the cost of producing oil rises sufficiently to make competition possible. Foreign experience has shown that coal is the most logical new source of motor fuel and lubricants. Picturing the place of Illinois coals in coming developments, Dr. Reed stated that at the rate of 4 tons of coal per ton of motor fuel, 70 per cent of the State output, or 35,000,000 tons, would be required to supply the gasoline now refined in the Illinois market territory.

A major increase in screening, crushing and dedusting and a steady rise in mechanically cleaned output have characterized recent bituminous-coal-preparation developments, declared Ivan A. Given, associate editor, *Coal Age*. Smaller prepared sizes have increased in importance, along with slack and other residues, while mine-run has declined still further. And in States for which late data are available, slack and the smaller prepared sizes have gained at the expense of both mine-run and prepared coal. In the Alabama commercial classifications, 1929 output was divided as follows: prepared sizes, 26.5 per cent; slack, 40 per cent; mine-run, 33.5 per cent. The 1935 figures were: prepared, 19.7 per cent; slack, 52.3 per cent; mine-run, 28 per cent. Illinois proportions were as follows in 1930: prepared, 47.5 per cent; screenings and carbon, 30.7 per cent; mine-run, 21.8 per cent. In 1935, the figures were: prepared, 46.2 per cent, screenings and carbon, 33.8 per cent; mine-run, 20 per cent.

Problems in the dustless treatment of bituminous coal were discussed by H. H. Morris, Sun Oil Co., Philadelphia, Pa., including: type of treating oil or emulsion, oil-storage methods, application methods, the best place for treatment, type of nozzle to be used, and measurement of dust content and oil consumption. In addition to its primary value, said Mr. Morris, oil treating also offers to a greater or lesser degree the following advantages: less segregation of fines, easier unloading, improved ignition, lubrication of stoker mechanism, decreased tendency of coal to freeze, less arching in hoppers and a tendency toward moisture reduction in the case of washed coals.

Good, sound sales arguments backed up by coal that fits the arguments and is engineered to fit the plant are the modern aids to steam-coal selling, asserted A. C. Smith, fuel engineer, Consolidated Coal Co., Chicago, who backed up his contentions with concrete examples built around price considerations, plant condition, plant management, etc. As evidence of the fact that preparation, merchandising and engineering are the best bets today, Mr. Smith pointed to a survey of a group of Chicago plants using 450,000 tons, in which it was shown that 22 per cent purchased through friendship based on cost and performance and 41 per cent on steam cost only.

Operation of the pneumatic spreader-type stoker, which has made rapid progress in the past three or four years with changes in fuel types, was shown through the medium of colored movies by T. A. Marsh, central division engineer, Iron Fireman Manufacturing Co., Chicago. This stoker, Mr. Marsh pointed out, offers to the coal industry a market for fines and high-ash or clinkering coals, as well as the possibility of increased realization. Equipment of this type uses coal from 1½ in. down, the fines burning in suspension and the coarse coal on a grate.

Factors Governing the Selection of Coal From the Commercial Stoker User's Viewpoint

Factor	Importance Rating
Price	1
Recommendation of stoker dealer or salesman	2
High B.t.u. content	3
Ease of operation	4
Low freight rate	5
Recommendation of other stoker users	6
Recommendation of coal merchant; dustless treatment	7
Minimum non-combustible (low ash)	8
Special sizing	9
Freedom from fines	10

Factors Governing Selection of Stoker Coals by the Retail Dealer

Factor	Importance Rating
Dependablity and freedom from complaints	1
Acceptance of the coal in a community by stoker users, dealers and manufacturers	2
Special preparation or sizing	3
Margin of profit	4
Prestige or standing of coals from a particular district	5
Reputation of the coal producer	6
Present tie-up with product or producer	7
Competitive price and freight-rate structures	8
Special sales helps	9
"Geographic complexes"	10

Operators Sue to Enjoin St. Louis Smoke Law

Suit to enjoin the city of St. Louis, Mo., from enforcing its new smoke-control ordinance was filed in federal District Court on May 29 by Samuel White and Frank Sergent, owners of the Bell Heat, Coal & Mining Co. The plaintiffs, who operate a mine near Belleville, Ill., object especially to Sec. 18 of the ordinance, declaring that administrators of the act threaten to prevent the plaintiffs from bringing into the city coal which will pass through a 2-in. circular screen and which contains over 12 per cent dry ash or 2 per cent sulphur on a dry basis or larger coal containing visible impurities in excess of 0.75 per cent per ton unless washed and hand-picked or cleaned.

The ordinance was passed Feb. 5 and became effective six days later, except for Sec. 18, which goes into effect on July 1.

Completing the Record

Power equipment exhibited at the Cincinnati exposition of the American Mining Congress included the "Everlast Super-Weld" rail bond of the Penn Machine Co., Johnstown, Pa. Through oversight, this product was omitted from the summary appearing on pp. 279-80 of the June *Coal Age*.

Mechanization Group Meets

The Mechanized Mining Commission set up in the new Appalachian agreement, ratified on April 2 (*Coal Age*, May, p. 231), held its organization

meeting on June 2 in New York. The following officers were elected: chairman, D. C. Kennedy, secretary, Kanawha Coal Operators' Association; secretary-treasurer, Thomas Kennedy, secretary-treasurer, United Mine Workers; assistant secretary-treasurer, S. C. Higgins, secretary, New River Coal Operators' Association.

McGraw, Jr., Succeeds Muir

Effective June 21, James H. McGraw, Jr., was elected president of the McGraw-Hill Publishing Co. to succeed Malcolm Muir, resigned. Mr. McGraw, Jr., continues as chairman of the board and assumes the additional responsibilities of the office of president.

Following his graduation from Princeton University in 1915, Mr. McGraw entered the service of the company and for 21 years has served actively in various posts connected with its publishing activities. After eight years of service with individual papers and groups of papers, he entered the general management of the company as treasurer in 1923, and became executive vice-president in 1932. In 1935 he was elected chairman of the board to succeed James H. McGraw, founder of the company.

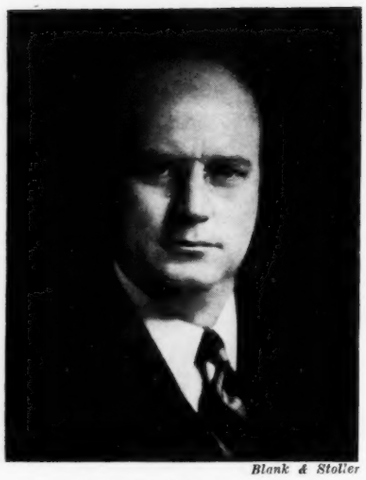
In 1932 and 1933, Mr. McGraw served as president of the Associated Business Papers and in addition to his work in his own company he has contributed generously of his time and effort to the advancement of business-paper publishing. Thoroughly grounded in the editorial tradition, he has applied himself aggressively to keeping the business paper abreast of what is best in modern publishing practice from the viewpoint of both readers and advertisers.

John T. Connery Dies

John Tobin Connery, 76, president of the Miami Coal Co., formerly operating in Indiana, and a well-known hotel operator, died June 5 of heart disease in the Edgewater Beach Hotel, Chicago, after a long illness. His first job was as yard clerk for the E. L. Hedstrom Coal Co., Chicago, later becoming manager of the Youghiogheny & Lehigh Coal Co. He acquired the Miami company in 1904.

Oscar Cartlidge Passes

Oscar Cartlidge, 67, for many years a consulting engineer but for the last two years affiliated with the Marietta Manufacturing Co., Point Pleasant, W. Va., died June 10 of pneumonia after a brief illness at Charleston, W. Va. A native of Illinois, Mr. Cartlidge started his business life as a miner, soon advancing to the post of mine foreman for the Raymond Coal Co. Later he held similar positions with the West Virginia Coal Co., Johnson City Coal Co. and the Benton Coal Co., all of Illinois, and the Kansas & Texas Coal Co., in Arkansas. Next he became superintendent of the Egyptian Coal Co., in Illinois, and then returned to the Johnson Coal Co. as assistant superintendent. Taking up engineering work, he was appointed mine engineer for the Benton Coal Co. and the Hart-Williams Coal Co., subsequently becoming county mine inspector in Franklin County, Illinois. Later he was made State inspector of mines and then manager of the Illinois mine-rescue stations.



Blank & Stoller

James H. McGraw, Jr.

Industrial Notes

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J., has appointed J. J. Summersby, assistant vice-president, as general sales manager. Since joining the company in 1920 as sales engineer he has been district sales manager, divisional sales manager and assistant general sales manager.

HARNISCHFEGER CORPORATION, Milwaukee, Wis., has appointed L. T. McGuire divisional manager of its large-excavator division.

DURALOY CO. has appointed Harvey T. Harrison sales manager with headquarters at the company's main office and plant, Scottdale, Pa.

MACWHYTE CO., Kenosha, Wis., has elected George S. Whyte, formerly president, to the newly created office of chairman of the board of directors. Jessel S. Whyte, formerly vice-president and general manager, succeeds his father as president.

BABCOCK & WILCOX TUBE CO., Beaver Falls, Pa., announces the appointment of J. P. Boore as assistant general sales manager.

CRANE CO., Chicago, has coordinated all its activities concerned with the estimating, engineering or sales of valves, fittings, pipe and fabricated piping into one unit, the valve and fitting department, with W. H. Pape as manager.

ROOTS-CONNERSVILLE BLOWER CORPORATION, Connersville, Ind., announces the following appointments of zone representatives: Carl B. Sunderland, Muncie, Ind., covering Indiana, Ohio, Michigan, Illinois and Kentucky; J. J. Heinrikson, Kansas City, Mo., western Missouri, Kansas, Nebraska and southwestern Iowa.

UNITED STATES RUBBER PRODUCTS, INC., has announced that L. F. Koepp, formerly salesman in the Seattle (Wash.) district, has been appointed manager of mechanical sales there. He succeeds C. W. Gilmer, who has been transferred to the New York office.

HYMAN MICHAELS CO. has removed its general offices to 122 South Michigan Ave., Chicago.

Mine Fatality Rate Higher

Coal-mine accidents caused the deaths of 54 bituminous and 29 anthracite miners in April last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 25,735,000 tons, the bituminous death rate in April was 2.10 per million tons, compared with 2.27 in the preceding month and 2.89 in April, 1936. The anthracite fatality rate in April last was 4.31, based on an output of 6,736,000 tons, as against 3.76 in the preceding month and 3.14 in April, 1936. For the two industries combined, the death rate in April last was 2.56, compared with 2.40 in the preceding month and 2.92 in April, 1936.

Comparative fatality rates for the first four months of 1936 and 1937, by causes, are given in the following table:

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

January-April, 1936 and 1937

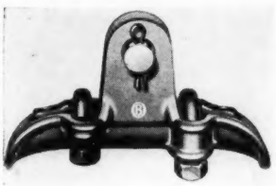
Cause	Bituminous: Number Killed		Bituminous: Killed per Million Tons		Anthracite: Number Killed		Anthracite: Killed per Million Tons		Bituminous-Anthracite: Killed per Million Tons	
	1936	1937	1936	1937	1936	1937	1936	1937	1936	1937
Falls of roof and coal...	218	186	1.525	1.124	54	45	2.681	2.380	1.668	1.257
Haulage	55	77	.385	.481	7	12	.348	.635	.380	.497
Gas or dust explosions:										
Local explosions	4	3	.028	.019	11	..	.546	....	.092	.017
Major explosions	8	27	.056	.169	..	..	....	....	.049	.151
Explosives	15	4	.105	.025	7	8	.348	.423	.135	.067
Electricity	6	16	.042	.100	2	1	.099	.053	.049	.095
Mining machines	7	3	.049	.019	..	.	....	....	.043	.017
Other machinery	4	3	.028	.019	1	..	.049	....	.031	.017
Miscellaneous:										
Minor accidents	11	6	.077	.037	9	5	.447	.264	.123	.061
Major accidents	..	.	....	....	..	..	....	....	....	....
Shaft:										
Minor accidents	3	10	.021	.062	2	1	.099	.053	.031	.061
Major accidents	..	..	....	....	..	..	....	....	....	....
Stripping or open-cut	5	4	.035	.025	3	4	.149	.211	.049	.045
Surface	12	23	.084	.144	8	5	.397	.264	.123	.156
Total	348	356	2.435	2.224	104	81	5.163	4.283	2.772	2.441

WHAT'S NEW

In Coal-Mining Equipment

SUSPENSION CLAMP; WIRE BRACKET

Expanding its line of suspension clamps to provide the proper size for every need, the Ohio Brass Co., Mansfield, Ohio, has added a clamp with a 0.7-in. cable-seat diameter. Thirteen clamp sizes, from 0.4 to 2.25 in., are now available.



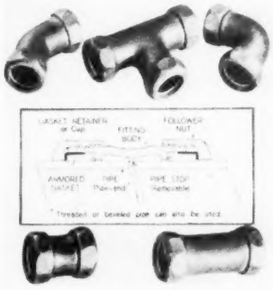
The new size is said to be suitable for 350,000-circ.mil copper cable, 250,000-circ.mil copper cable with liners, 266,800-circ.mil steel-reinforced aluminum cable or 4/0 steel-reinforced aluminum cable with liners. The clamp can be furnished with a J- or U-bolt, with or without liners, and with or without a socket fitting. Over-all length is 7⅛ in.

To provide a suitable means of supporting suspension clamps for overhead ground wires on wooden poles, Ohio Brass also has developed a ground-wire bracket which it states prevents the loss of considerable pole height. In the design of such lines it usually is the practice to install a pole extension above the cross-arm. The new fitting allows the ground wire to be attached to the pole itself, eliminating the need for an extension and requiring only 1¾ in. of headroom. In combination with the suspension clamp commonly used with ground wires, the device sacrifices only 3¾ in. of pole height. The bracket can be furnished alone or in combination with the proper suspension clamp, as shown in the accompanying illustration.

—◇—

PIPE FITTINGS

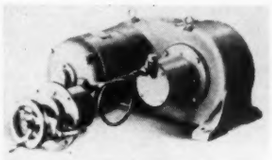
For simplifying joint-making and repair work on both inside and outside oil, gas, water, air or other industrial pipe lines, S. R. Dresser Mfg. Co., Bradford, Pa., offers the new Style 65 fittings, including standard and extra-long



couplings, ells (both 45 and 90 deg.) and tees in standard black or galvanized steel pipe sizes from ½ to 2 in. inner diameter. These fittings are designed for use with plain-end pipe, and after inserting the pipe into the fitting (which comes completely assembled) it is necessary only to tighten two threaded octagonal follower nuts with a few turns of the wrench. The resulting joint, according to the company, not only is permanently tight but also absorbs normal vibration, expansion and contraction and permits deflections in the joint.

REMOTE CONTROL

U. S. Electrical Motors, Inc., Los Angeles, Calif., offers a hydraulic remote control for U. S. "Varidrive" variable-speed motors. Speed variation

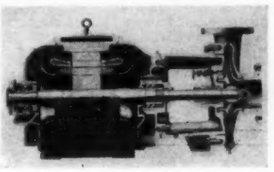


is accomplished by turning a handwheel at the control location, moving a cylinder at the variable-speed unit and thus changing the speed.

—◇—

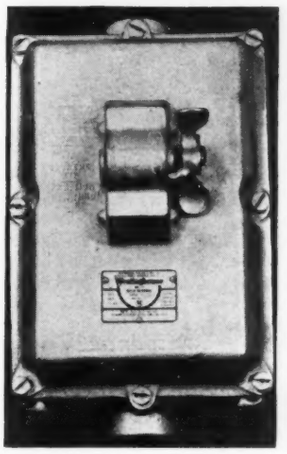
PUMP

A new line of motor-driven centrifugal pumps with capacities of from 5 to 1,200 g.p.m. at heads from 10 to 230 ft. is offered by the DeLaval Steam Turbine Co., Trenton, N. J. The pump is mounted on the end bell of an electric motor to form a compact self-contained unit with only one shaft and two bearings. A motor-mounted unit is shipped ready for immediate connection to piping and power lines, and can be installed with the shaft horizontal, vertical or inclined. Also, the unit can be mounted on a hand truck or suspended from a sling. Pump casing is of cast iron, with bronze impeller, wearing ring, shaft sleeve, stuffing-box gland and lantern ring. Parts subject to wear are made to limit gages to permit interchangeability and replacements can be inserted without fitting. All pump parts can be removed without disturbing the motor.



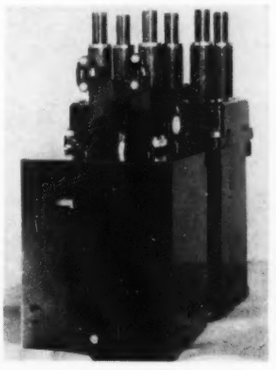
CONTROLS

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., offers a new line of explosion-proof manual motor starters which it states are particularly adapted to the control and protection of single- and polyphase squirrel-cage motors where explosion-proof



equipment is desired. These across-the-line starters have a disk thermostat for overload protection, a quick-make quick-break toggle mechanism, trip-free handle, long-life contacts and a corrosion-resisting finish on all parts. They are front operating, and changes from one rating to another are accomplished by changing heaters.

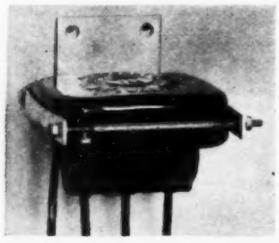
Designed for industrial and central-station use, Westinghouse also offers new 50,000-kva. indoor oil circuit breakers said to be especially desirable



when space is limited. The breakers are manually or electrically operated, automatic or non-automatic and single throw with adaptable mounting arrangements. Ratings are: 50,000 kva. interrupting capacity—600 amp., 15 kv.; 1,200 amp., 7.5 kv.; and 2,000 amp., 5 kv., 2- and 3-pole, single throw. Double-

pole breakers are obtained by omitting the center pole of a three-pole breaker.

Westinghouse also offers watt-hour meter protectors designed to protect meters against lightning-surge voltages. These protectors are



available for indoor and outdoor service, the latter inclosed in a moisture-proof porcelain casing. The units also may be used to protect the secondaries of transformers and as two-pole arresters for the protection of single-phase circuits.

A number of new reflectors for various services are additional Westinghouse products. These include: angle-type vapor-proof reflectors for use with 250-watt high-intensity mercury-vapor lamps where service conditions are severe; 250-watt symmetrical angle reflectors especially for high-intensity mercury lamps and providing intensive local lighting of vertical and horizontal surfaces from the side; 250-watt inclosed aluminum dome-type low-mounting reflectors, mercury lamps, for intensive general illumination where the mounting height is not over 20 ft.; and 250-watt inclosed dome-type reflectors, mercury lamps, for general industrial lighting applications where mounting heights range from 8 to 18 ft.

TRUCK

Mack Trucks, Inc., New York City, offers the new Model EJ truck with a gross rating of 16,000 lb. It is available in four wheelbases ranging from 146 to 194 in. Three tractor wheelbases ranging from 139 to 158 in. also are available. The unit is powered by a 6-cylinder engine and maximum tire size is 8.25-20. Gasoline-tank capacity is 20 gal.

RESPIRATOR

Chicago Eye Shield Co., Chicago, offers the new "Cesco No. 90 Healthguard" respirator—approved by the U. S. Bureau of Mines—for use in Type A dusts (those tending to produce silicosis). Features cited by the company include a filtering element with one surface which removes even microscopic dust and yet does not hamper breathing, and a special seal at the facial contour.

PAYROLL TYPEWRITER

To enable concerns which otherwise have no need of elaborate equipment to meet Social Security report requirements efficiently and at low cost, Burroughs Adding Machine Co., Detroit, Mich., offers a new payroll typewriter with wide carriage and other special features. The

new machine, according to the company, writes four records at one time, as follows: employee's statement, earnings record, pay check or envelope, and payroll journal entry. In addition, the machine, it is stated, can be used for preparing statistical or financial reports, writing invoices and statements, general correspondence, etc.

GAS ALARM

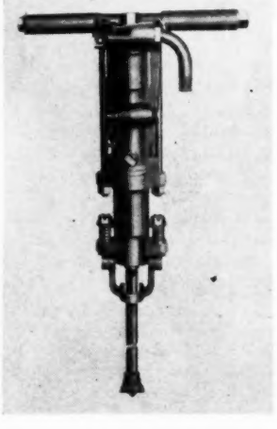
Mine Safety Appliances Co., Pittsburgh, Pa., now offers the new "MSA Combustible-Gas Alarm," which it describes as an instrument for continuously sampling atmospheres in which combustible gases or vapors may be present, giving a warning when the concentration of flammable gases exceeds a predetermined limit. The unit may be adapted for automatically controlling processes or ventilation equipment. Whether used as an alarm or as a means of control, the instrument, it is stated, may be set to operate at any point between 10 and 100 per cent of the lower explosive limit. When used with a dilution valve, the range may be extended beyond the explosive limit. The instrument, designed for permanent installation and continuous operation, and which can be used with a recording potentiometer, is said to be suitable, with individual calibration, for use with practically any flammable gas or vapor.

BREAKERS

Heineman Electric Co., Trenton, N. J., offers "Re-Cirk-It" breakers stated to be fully magnetic non-thermal units in instantaneous and time-delay types for ratings from 50 milliamperes up to 35 amp. and for pressures from just a few volts up to 250 d.c. or 460 a.c. An ample choice of poles up to three, overload and shunt-trip coils and casing styles, are available. No resetting is required and the breaker, operated by a tumbler switch, cannot be held closed against an overload or short circuit. In time-delay units, four time-overload curves are offered. The breakers are offered in open types, in inclosed Bakelite cases for machine or panel mounting, in Bakelite inclosed types for panel groups, in steel safety cabinets and with a heavy cast-metal housing for use in flammable and explosive locations.

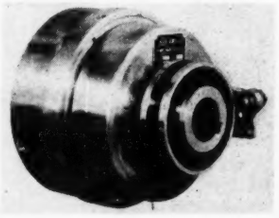
DRILL

Ingersoll-Rand Co., Phillipsburg, N. J., offers the new JA-55 "Jackhamer," which it describes as a hard-hitting fast-drilling tool weighing 55 lb. and designed especially for harder rock and deeper holes. With a low air consumption as a result of improved valve design, it is said to be particularly suitable for use with portable air compressors or where air supply is limited.



CLUTCH

A new type magnetic clutch bearing the designation Style "E" is offered by the Stearns Magnetic Mfg. Co., Milwaukee, Wis. The clutch is recommended for universal dry or wet application by the company, which describes it as compact and simple in design, making it particularly suitable for machine tools and similar equipment. Features include:



automatic self-alignment; simplified latch and groove-lock design permitting easy adjustment; easy removal and replacement of lining; and adaptability to the use of larger bores.

CONVEYOR

Described as light, strong, easily portable and moderately priced, the new Atlas, high-speed portable conveyor is announced by the Atlas Con-

veyor Co., Clintonville, Wis. Specifications are: length, 24 ft.; belt width, 16 in.; capacity, 25 to 90 tons per hour, depending upon material handled and continuity and uniformity of loading; discharge height, 11 ft. maximum; charging height, 13 in.; weight, 2,800 lb. with electric motor or 3,000 lb. with gasoline motor.

BELT HOOKS

Armstrong-Bray & Co., Chicago, announce a new line of "Wiregrip" carded belt hooks mounted on special processed cards which hold the hooks firmly in the card, strengthening them and yet permitting the workmen to cut off the required number more easily without destroying or disturbing the others. Wiregrip hooks, it is stated, may be applied with any standard belt lacer or with a Wiregrip belt-lacing machine.